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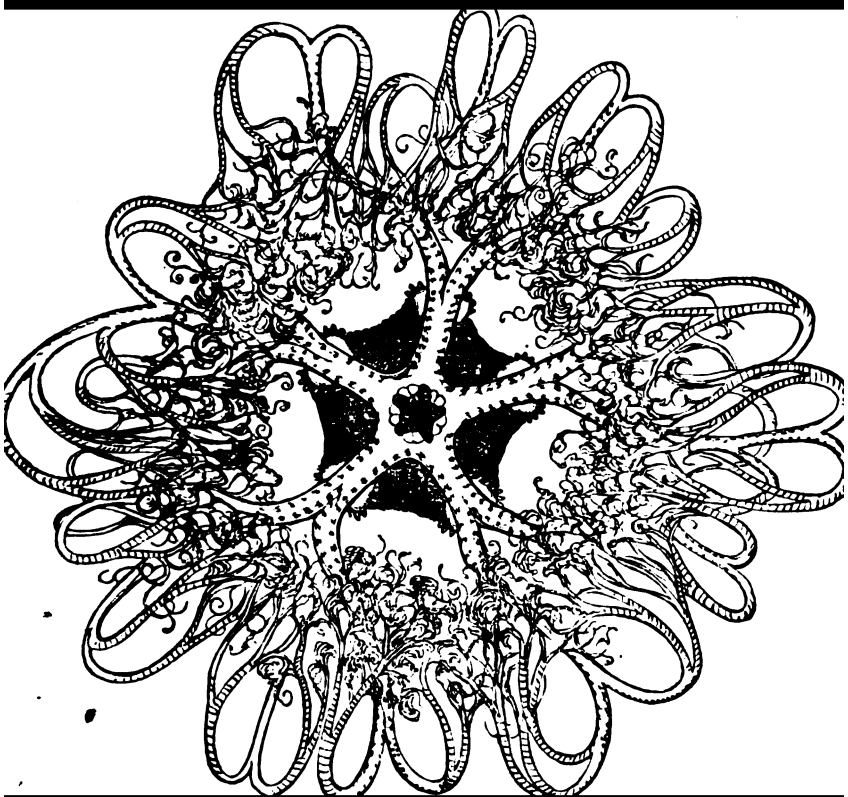
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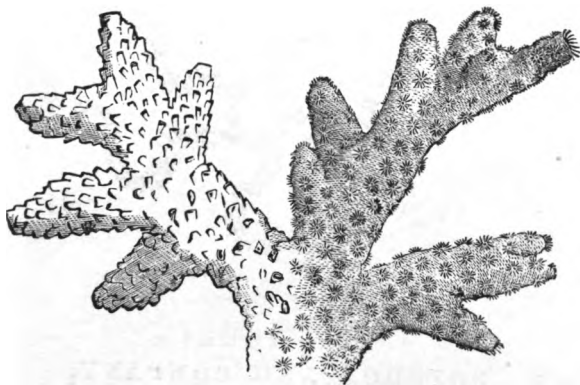
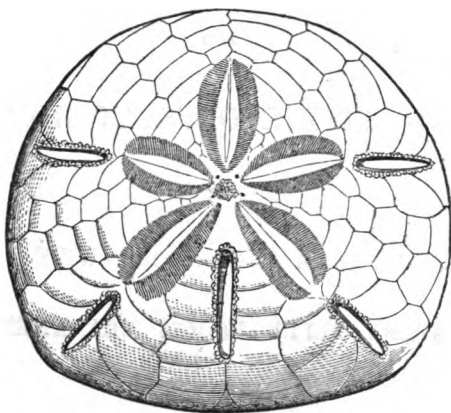


*Pictures and Stories of Animals:
Sea-stars, jelly-fishes, ...*

Abby Amy Tenney

KD 56972 (6)





THE KEY-HOLE SEA-URCHIN.

THE MADREPORE CORAL.

PICTURES AND STORIES OF ANIMALS

FOR

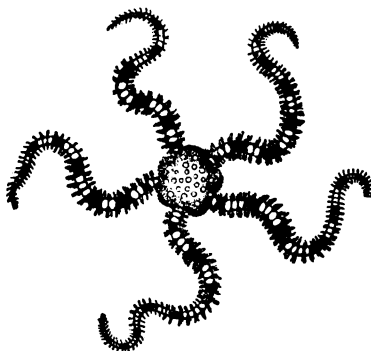
THE LITTLE ONES AT HOME.

BY

MRS. SANBORN TENNEY.

SEA-STARS, JELLY-FISHES, SEA-ANEMONES,
AND CORALS.

WITH EIGHTY-THREE WOOD ENGRAVINGS.



NEW YORK:
SHELDON AND COMPANY,
498 AND 500 BROADWAY.
1868.

KD 56972 (6)



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PICTURES AND STORIES OF ANIMALS

FOR THE LITTLE ONES AT HOME.

BY MRS. SANBORN TENNEY.

*In Six Volumes. Each Volume complete in itself. Containing 500
Wood Engravings.*

QUADRUPEDS.

BIRDS.

FISHES AND REPTILES.

BEEES, BUTTERFLIES, AND OTHER INSECTS.

SEA SHELLS AND RIVER SHELLS.

SEA-URCHINS, STAR-FISHES, AND CORALS.



P R E F A C E .

BELIEVING that there is nothing in which children are naturally more interested than they are in animals, and that there are no other objects which can be used to greater advantage than these in their instruction, the writer has prepared these Pictures and Stories of Animals for the Little Ones, to instruct as well as to interest and amuse them.

There are six books in the series, each one complete in itself; and they are so arranged that together they make a Juvenile Library of the Natural History of Animals.

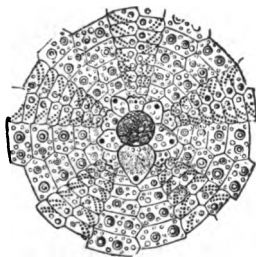
The first book contains pictures and stories of Mammals or Quadrupeds; the second book, pictures and stories of Birds; the third, of Reptiles and Fishes; the fourth, of Bees, Butterflies, and other

Insects, and of Crustaceans and Worms ; the fifth, of Shells, and the animals which live in them ; and the sixth, of Sea-Cucumbers, Sea-Urchins, Star-Fishes, Jelly-Fishes, Sea-Anemones, and Corals.

The wood engravings in the six books are more than five hundred in number, and are true to nature. Several of them were drawn and engraved expressly for this series ; the others are mainly from Tenney's "Manual of Zoölogy," "Natural History of Animals," and other works of Tenney's Natural History Series.

August, 1868.





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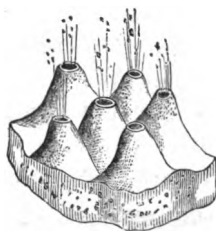
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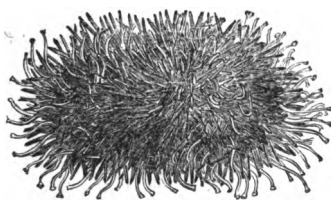
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PICTURES AND STORIES OF ANIMALS.

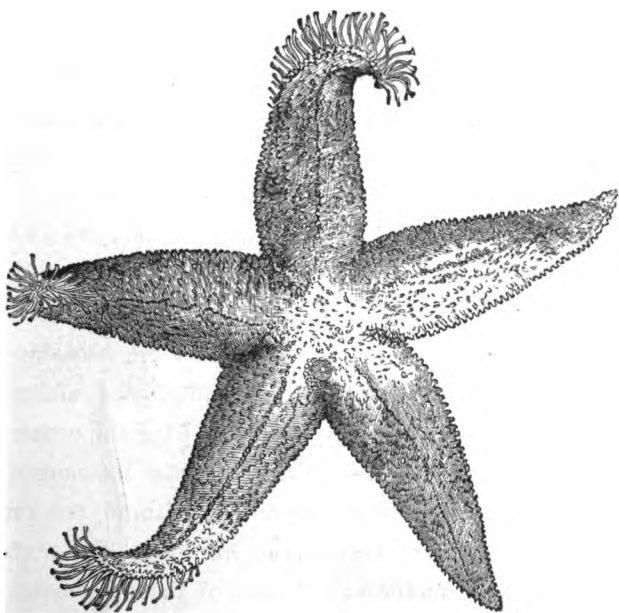
DEAR CHILDREN:—

IN the other little books I have shown you pictures and told you stories of the Quadrupeds, or Mammals, most of which live upon the land, but some kinds of which live in the sea; of the Birds that live in the forest, groves, and fields; of the Reptiles that live on the land and in the sea, and in rivers, ponds, and lakes; of the Fishes that live all of the time in the water; of the busy Bees, the beautiful Butterflies and Moths, the buzzing Flies, the shining Beetles, the singing Cicadas and Grasshoppers, and the lace-winged Dragon-Flies; of the Spiders, with their wonderful webs; of the Crabs, Lobsters, and Shrimps, with their hard shells and curious legs; of the Worms, some of which burrow in the ground, and some of which

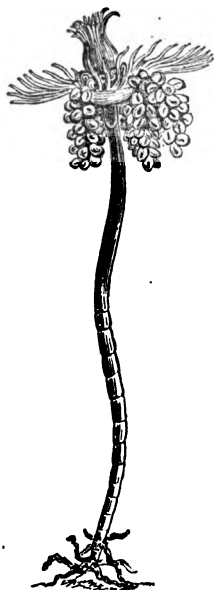
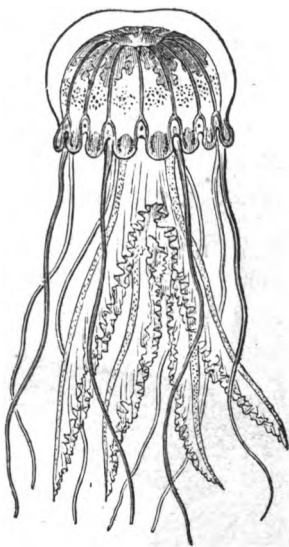
grow like beautiful flowers in the sea ; of the Argonaut, with its thin and delicate shell, and the Cuttle-Fishes, with their long and terrible arms, and the Nautilus, with its curious chambered shell ; of Sea-Snails, Land-Snails, and River-Snails ; of Oysters and Clams ; and of the Lamp-Shells, Tunicates, and Bryozoans, which are fixed to rocks and shells, and other objects in the water, and which remind us of the plants and flowers upon the land.

In this little book I will show you pictures and tell you stories of the Star-shaped Animals, or Flower-like Animals, or Radiates, — they are called by all of these names ; for some of them are star-shaped, others look like flowers, and all are radiate in form, that is, the parts stand out from the centre as the parts of a flower stand out from its centre, or as the spokes of a wagon-wheel stand out or radiate from the central part or hub. On the next two pages are pictures of several of these animals ; and by looking at them, you will see that they are rightly named Radiates.

All of the Radiates or Star-shaped Animals live in the water, and nearly all of them live in the sea or ocean ; only a few kinds live in brooks, ponds, and lakes.

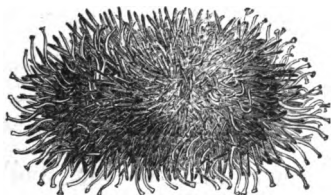


A Radiate, or Star-shaped Animal.



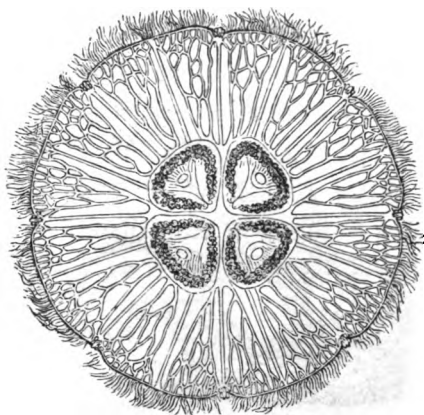
Radiates, or Star-shaped, or Flower-Animals.

There are very many kinds of the Star-shaped Animals, or Radiates. Some kinds have a rough and even spiny surface; their spines stand out all round like those of the Hedgehog, whose picture I have shown you in the book of Mammals; and so they are called the Echinoderms, — a name that means that they have a skin like a hedgehog. Here is the picture of one of them.



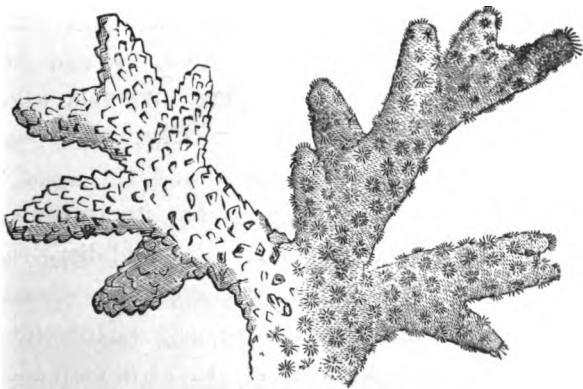
An Echinoderm.

Some kinds of the Radiates have a body as soft as jelly, and long or short fringes or tentacles, as you see them in the picture on the next page; and they are called Jelly-Fishes. They are also called Sea-Nettles, or Acalephs, a name which means that they sting like a nettle; for when they touch your skin they cause a stinging like that which you feel after touching the nettle-plant.



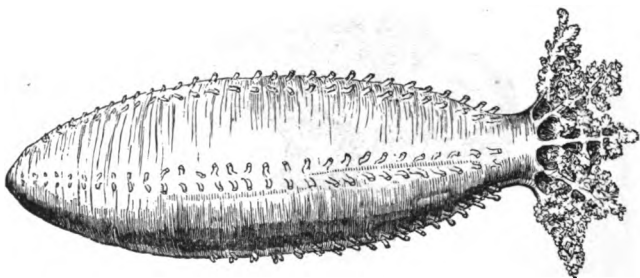
A Jelly-Fish, or Acaleph.

There are other kinds of the Radiates which look like plants and flowers. They live and grow in groups and clusters, and look like flower-beds and flower-gardens on the bottom of the sea. Some kinds of these are called Sea-Anemones, or Actinias; and other kinds are called Coral-Animals, because they form coral; and all of them are called Polyps, a name which means that they have many appendages or feet, although they have no true feet. On the next page there are pictures of two kinds of polyps.



Polyps.

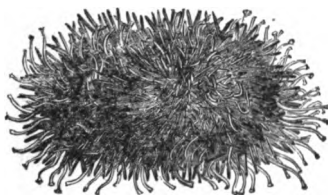
You will now wish to know more about the Radiates, and I will tell you first about the Spiny-skinned Radiates, or Echinoderms. Some kinds are long, and look much like a cucumber before the blossom has fallen off, and so these are called



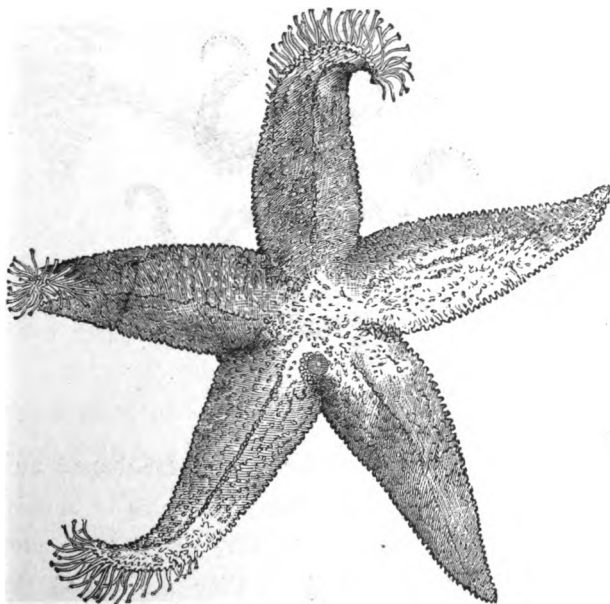
A Sea-Cucumber.

the Sea-Cucumbers; these have no spines like most of the Echinoderms, but there are hard limestone particles in their skin.

Some kinds of echinoderms are in form much like a ball flattened on one side; and they look a little like a chestnut-burr, before it has opened; these are the true Sea-Urchins, or Sea-Hedgehogs. The one whose picture I show you, at the top of the next page, is very common on the rocky sea-coast of New England.

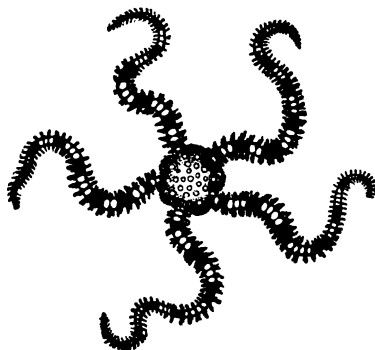


A Sea-Urchin.



A Star-Fish.

Some kinds of echinoderms are star-shaped, and they are covered with hard tubercles instead of long spines, and they are called Star-Fishes; although they are in no way like true fishes, except that they live in the water. But a long time ago people used to call all kinds of animals which live in the water, fishes.

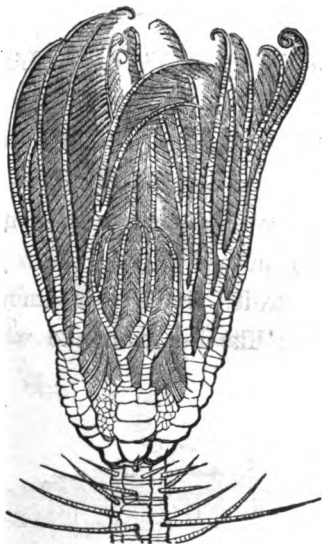


A Serpent-Star.

Some kinds of echinoderms are star-shaped, and are covered with either hard tubercles or spines, and each arm or ray of the star tapers to a point, like a snake's tail; and so they are called the Snake-tailed Star-Fishes, or Serpent-Stars. They

are also called Brittle-Stars, because they so easily break in pieces when any one tries to catch them.

And some kinds of echinoderms have a stem, and are fixed to rocks in the sea, and look like



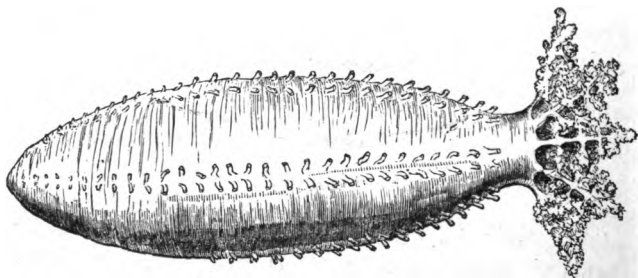
A Crinoid.

plants, and so they are called Crinoids, a word which means that they are lily-like animals. The one whose picture I show you, lives in the sea near the West Indies, and is the only kind now

living which has a stem; but in many parts of our country, and in other countries, the rocks are filled with those that lived when the ocean covered the places which are now dry land.

THE SEA-CUCUMBERS, OR HOLOTHURIANS.

IF you will look at a cucumber in the garden before its blossom has fallen from the end of it, you will see that its form is very much like that of the curious animal whose picture you see here, and which is called the Sea-Cucumber, because it looks so much like its namesake which grows in the garden.



The Sea-Cucumber.

The Sea-Cucumber lives on the bottom of the

sea, not far from the shore, in the northern or cool parts of the Atlantic Ocean. It is very abundant on the coast of Maine, and around the island of Grand Manan. It has a leather-like skin, but one which easily stretches and contracts. It is from six to twelve inches long when at rest, and a very large one can stretch itself so as to be two or three feet long. It is somewhat five-sided, and it has five double rows of organs, which are sometimes called suckers, sometimes tubular feet, and sometimes ambulacra; the last name comes from a word which means a walk, or an alley. The mouth is at one end, and around it are ten tentacles, as they are called, and these are divided into the most beautiful and delicate branches, or fringes. In many kinds of the Sea-Cucumbers these fringes are as delicately branched and as richly colored as the most delicate and beautiful seaweeds which we gather and press on our visits to the seaside.

But if we would see the beauty of a Sea-Cucumber, we must examine it while it is in its home in the sea, or at least while it is in the water. Those which we see in a Natural History Museum

have lost all of their beauty. As soon as a sea-cucumber is taken from the water it shrinks up and loses its beautiful form and its bright colors, and looks like a mere lump of flesh. But if we put it into a tank or basin of clear sea-water and wait patiently, it soon begins to change its form and its color, and by and by it appears full and plump, and gradually it unfolds its seaweed-like tentacles, or fringes, in all their wonderful delicacy and beauty.

The Sea-Cucumber is not a very active animal, but it has a wonderful power of changing its form and appearance. Sometimes it stretches itself out so long that it looks like a very large worm ; sometimes it makes itself small in the middle and large at each end, so that it looks a little like an hour-glass, and sometimes it takes the form of a ball.

There are many kinds of sea-cucumbers, or holothurians. Some kinds are large, like the one of which I have just told you, and some are small, scarcely larger than your finger. Some kinds are smooth ; others are rough ; and some kinds are even covered with hard limestone plates,

or scales. Some kinds of sea-cucumbers have the suckers or tubular feet in five rows, like the one whose picture I have shown you ; other kinds have the suckers scattered over the whole body ; others have only three rows of suckers, and these are all on one side of the body ; and others are very long and worm-like, and have no suckers.

It is said that some kinds of sea-cucumbers have the strange power of throwing off or shedding parts of their body, such as the tentacles, or fringes, the mouth, and various other parts ; that sometimes they even shed all of the internal organs of the body, so that they become like an empty sac, or bag ; and that in a few months all of the lost parts grow again, so that these animals appear just the same as they did before the parts were shed. It is also said that some kinds have the power of dividing into two or more parts, and that sometimes each part becomes a perfect sea-cucumber !

Sea-cucumbers eat almost all kinds of food which they find. as sea-weeds, living corals, and other marine substances.

The kind of sea-cucumber whose picture I have

shown you on the twentieth page is often called the Pentacta, and lives in the cool parts of the Atlantic Ocean, as I have before told you; but there are other large kinds that are very abundant in the warm regions, especially in the Indian Ocean. The name Pentacta means five-edged.

In China, and in countries near the Indian Ocean, the large sea-cucumbers are called Trepangs. The Chinese use them for food, and are very fond of them; they make soups of them. Hundreds of small vessels and many hundred men are employed in catching Trepang near the shores of the islands in the Indian Ocean, and in preparing and sending them to the Chinese. The large Trepangs are sometimes caught with spears, but most of them are gathered by divers, who catch them in their hands; and they are so abundant that a diver often brings up eight or ten at a time. As fast as the divers bring them up, they put them in a boat, and as soon as the boat is loaded it is taken to the land, which is not far distant. Here the Trepangs are unloaded and split open with a knife, and boiled in large kettles of sea-water, and pressed flat with heavy stones, and dried on

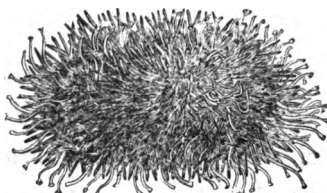
grass mats in the sun, and then packed in bags and sent to the Chinese, who gladly buy all they can get.

THE SEA-URCHINS, OR SEA-HEDGEHOGS.

WHEN you go to Nahant, or to some other rocky place on the sea-shore, you may look for Sea-Urchins in the pools of sea-water which are left far down among the rocks when the tide is very low. These pools are bordered and often lined with sea-weeds, and are alive with beautiful and interesting objects, which you will be delighted to see. Here are beautiful sea-weeds, perhaps of many kinds; star-fishes, and the little purpuras and other mollusks cling to its rocky sides, or hide under the sea-weeds and in the clefts of the rocks; crabs lurk in the dark corners; and hermit-crabs live in the dead shells at the bottom.

But at first, perhaps, you do not see one sea-urchin, although there may be a hundred in the pool; for they cling to the bottom, or hide in the holes and fissures of the rocks, and draw the

fine sea-weeds closely about them, so that they are wholly hidden from your sight. But push aside the sea-weeds with a stick, and look sharply, and soon you will begin to find the spiny fellows, just like the one whose picture I here show you, and



The Sea-Urchin.

you will be surprised and delighted to see how many you can gather out of a pool where at first you did not see a single sea-urchin.

After you have gathered all you can see, you can still find more of them by putting your arm down into the water and feeling for them with your hand ; you will know when you have found one, for you will feel its sharp spines.

Sometimes, when feeling for sea-urchins under the sea-weeds, you may get hold of a crab, and he may nip you a little with one of his claws ; but you need not be alarmed ; if he cling to your

hand, you may quickly break off his claw; it will not hurt him much, and it will soon grow out again, and the crab will be as well off as before, only the new claw will for a time be smaller than the old one.

When you try to take sea-urchins from the sides and bottom of the pools where they live, you will find that they cling to the ground or rocks very closely. They do this by means of their numerous tubular organs, or tubular feet as they are often called. And if you place them in a little pool of water to keep them alive, while you are searching for others, you will think, on looking into the pool after a little while, that your sea-urchins have crawled away; but on looking closely you will find that with their tubular feet they have drawn the little sea-weeds so tightly about them as to entirely hide them from your sight. If you lay them down, wrong side up, in the pool, by means of their long tubular organs they will turn over, and then hide themselves by drawing the sea-weeds all about them.

The mouth of the Sea-Urchin is at the underside, so that the animal moves along with its mouth

downward, or at least with its mouth next to the surface on which it is moving.

The Sea-Urchins are very hungry animals, and with their stout horny jaws they eat sea-snails, mussels, shrimps, crabs, and all the other little animals which they can capture.

But I must tell you more about the different parts of the Sea-Urchins; and first I will tell you of the spines, because they are the first things which you see in looking at these animals. The spines are attached to little knobs or tubercles, which are upon the hard shell of the animal, and in such a manner that the animal can move them, and thus, it is said, they aid him a little in crawling from place to place. The spines are of different kinds on the different kinds of sea-urchins; in some kinds the spines are long, slender, and sharp; in others very stout and blunt; and in others very short, small, and delicate. The spines are bound to the knobs or tubercles upon the shell by the thin skin which covers the outside of the shell, and which is attached around the lower part of each spine; and it is by the action of this skin that the spines are moved. When the

animal dies, the skin decays or dries up, and no longer holds the spines in place, and they then easily drop off.

As the spines of the Sea-Urchin stand out in all directions from the shell of the animal, they serve to protect it from the attacks of its enemies, and they also prevent it from being injured when it is dashed against the rocks by the waves. And it is said that some kinds of the sea-urchins, which live in the warm seas of the tropical regions, can even dart their spines into the hand, if it be placed very close to them.

Mr. Bennett, a naturalist, says that once when searching for sea-animals among the rocks, near the shore, in the tropical regions, he felt a sharp pain in his hand, and upon looking at it he found his fingers covered with slender spines, which he believed to be those of a sea-urchin; he could not find the animal, however, but afterwards he found in the waters near the shore, and among the hollows in the rocks, some curious sea-urchins, which he believed were like the one which had wounded him, and he tried many times to see how near he could place his hand to them without getting wounded

with their spines. He says that he placed his hand near the spines so slowly and so cautiously that if they had even been fine needles and firmly fixed, so as not to be moved, they could not have harmed him; but they were always quickly and sharply struck into his hand.

When the spines are seen by means of a microscope, they are found to be finely and beautifully ribbed, and a slice across the spine, seen by the same means, shows that these ribs are little columns, and that the whole spine has the most delicate and beautiful structure.

The tubular organs or tubular feet are so curious that you will like to know more about them. Each sea-urchin has about two thousand of these feet, and can extend them far beyond its spines. A sea-urchin can even put out one of these tubes from the top of its shell, and bend it over so as to take hold of the ground on which it is lying. Each tube has at its end a little flattened disk, or sucker, and when the animal wishes to move he thrusts forth some of these tubes, and stretches them out and fixes the suckers to some object, and then contracts the tubes, thus drawing his body to-

wards the spot where the suckers are fixed. These tubular organs are also used by the Sea-Urchins in seizing food ; they are thrust out beyond the spines, and there float loosely in the water ; and if any little animal swims near enough, some of the little suckers are quickly attached to it by the Sea-Urchin, and then other tubes are bent towards the prey, and their suckers are attached to it, and then the little animal is drawn to the mouth of the Sea-Urchin and devoured. By means of these tubular feet, Sea-Urchins can move along all kinds of surfaces in the sea ; they readily move up the steepest sides of rocks, or even on the underside of overhanging rocks, without any danger of falling.

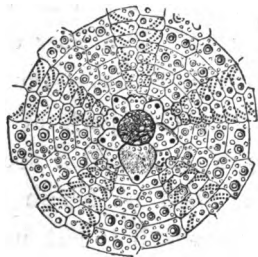
Besides the spines and tubular feet, there are other organs, called by the long name of *pedicellariæ*, which are found over the whole or nearly the whole surface of the Sea-Urchin, and which, when you are older, you will want to know about, although their name may now seem pretty hard to you. Each of these organs is much like a flower-stem with a bud, or knob, at the end. The knob at first sight looks as though it were solid, but it is really split into three parts, or prongs,

and the Sea-Urchin can open or shut the prongs as it pleases. When the parts are open, the three prongs are plainly seen, but when shut they fit closely together, and form the knob of which I have told you, and which, as I have said, seems perfectly solid. If, when the prongs or blades of the knob are open, the point of a fine needle, or any other minute substance, be placed between them, they instantly close and tightly grasp it.

What the *pedicellariæ* are for has for a long time puzzled every one who has studied the Sea-Urchin, and I do not suppose that any one yet knows all about them; but naturalists have observed them and studied them very long and very carefully, and at last they have found out something about them. It is now known that one of their uses is to keep the spines and the rest of the surface of the Sea-Urchin clean; and these organs are seen to be in action as long as there are waste particles upon the surface of the animal. A waste particle is seized by one of these little organs and then passed to another, and from this one to another, and so on till at last it is dropped off into the water.

I have told you that the Sea-Urchins have very strong jaws. These end in five very hard, pointed teeth, with which they crush the mollusks and the crustaceans upon which they feed. The five sharp teeth do not move up and down, as your teeth do, nor do they move sidewise like the jaws of insects, but they move towards each other, and when shut they meet and form a point. The jaws and teeth of the Sea-Urchin are often called Aristotle's Lantern.

I have told you that, when the Sea-Urchin dies, its spines fall off. You can then see its beautiful



The top of the Shell of the Sea-Urchin.

shell. It is not made of one piece, like the shell of a univalve mollusk, or of merely two pieces, like the shells of bivalve mollusks, of which you have read, but it is made of a great many prettily

formed pieces, which are fitted together in a most beautiful and perfect manner. In the shell of a Sea-Urchin there are five or six hundred pieces! On the page before this there is a picture of the top part of a Sea-Urchin after the spines have fallen off. See how beautiful it is, and how neatly the pieces or plates are fitted together to form the hard round shell of the animal!

The little round knobs, or tubercles, on the shell, are the places where the spines were attached; and the double curved rows of little dots show the holes through which the Sea-Urchin puts out its tubular feet. You may often find these shells upon the sandy beach, — the spines and the jaws and the inner soft parts of the animal all gone. When you find such a specimen, I want you to hold the shell up before your eyes, and look into the hole which is left in the bottom by the loss of the jaws; the whole inside is hollow, and the light will shine through all the little holes for the tubular feet, and the sight will be very beautiful, and will interest and please you.

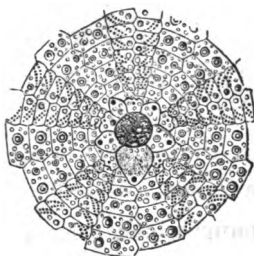
Many years ago the shells of Sea-Urchins were believed to be the shells of the eggs of some kind

of sea-animal, and so they were called Sea-Eggs; and this name is now often given to the Sea-Urchins themselves.

If you look at the shell of a Sea-Urchin when the spines are off, you will see ten double rows of plates which extend along the curved surface from the bottom to the top of the shell. In five of these double rows the plates are large, and without holes, and are covered with large and small tubercles. In the other five double rows the plates are smaller, and with few and smaller tubercles, and each plate has a double, curved row of little holes, through which the tubular feet are put out when the animal is alive. The plates which bear the holes are called the ambulacral plates, from a name which means a walk, or alley, as I have before told you; and the large plates without holes are called the inter-ambulacral plates. These are long words, but perhaps you can remember them; at least I hope that you will not be discouraged by them.

-At the end of each of the five belts or double rows of the smaller plates there is a little plate with a very minute hole in it; the place of this

hole is shown in the picture by a minute black dot, and I will show you the picture again that you may look at it now. The five minute holes are the places where the five eyes are situated when the animal is alive. Alternating with the five eye-plates are five other plates, each of which has a larger hole in it, as you may plainly see ; through these holes the eggs are laid. You see that one of the plates is much larger than the others, and is filled with



The top of the Shell of the Sea-Urchin.

very minute holes ; it is called the madreporic body, because it looks a little like coral, one kind of which is called madreporae. It is believed that this is a sort of sieve to strain the water which passes into the body of the animal.

. As the shell of the Sea-Urchin is made of solid

pieces, you may perhaps like to know how it can grow so as to fit the animal as he grows larger and larger. You will remember that I told you, in the book of Insects, Crustaceans, and Worms, that crabs, lobsters, and shrimps shed their shell from time to time, when it gets too small for them, for the shell of these animals does not grow larger after it is once formed. Sea-Urchins never shed their shell, and they need not do so, because it grows as fast as the rest of the animal does ; and I will tell you how it grows. Each of the pieces of an urchin-shell is covered, both above and below, and on all of its edges, with a layer of living flesh or skin ; even where the pieces seem to fit so tightly together there is a layer of flesh, or skin, between them in the living urchin. While the animal is alive this skin is constantly adding limestone particles to the sides and edges of each little plate, and making it larger and thicker, and thus the shell is all the time growing larger by the growth of each little plate of which it is made, and so the shell is always large enough for the soft parts of the inside.

In some parts of Europe Sea-Urchins are used by the people for food ; but, so far as I know, they

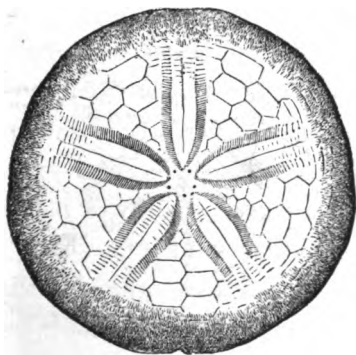
are not eaten in this country. They are the best at the time of the year when they are filled with eggs. They were very highly prized by the people who used to live long ago in Greece and Rome. Those people ate them with vinegar, wine, and honey, mint and parsley, and they thought them to be very healthful food. They often had sea-urchins for the first dish, or first course, at their great suppers or feasts; and so much did they prize them, that Horace, a very celebrated Roman poet, mentions and praises them in the poems which he wrote.

In the islands of the Pacific Ocean, the spines of one kind of sea-urchin have been gathered by the children, and used as slate-pencils; the spines having first been burned slightly to make them soft, so that they would not scratch the slate.

There is one very curious way which I have heard of, in which the spines of a sea-urchin were useful to a little animal, and I will tell you about it. In the spine of a sea-urchin a little mollusk once made a hole for his home. There he lived as safe and, we may believe, as happy as any little mollusk can be. He was safe, for if any hungry animal came to eat him, the sharp spines of the sea-urchin were standing out in all directions to defend and protect him.

There are many kinds of sea-urchins, and they are of many different forms and sizes. Some kinds are not more than an inch or an inch and a half in diameter; and some kinds are two, three, or even four or five inches in diameter.

When you go to Chelsea Beach, or to any other sandy sea-coast in the northern part of our country, you may perhaps find a pretty little sea-urchin which is flat, and which looks much like a little cake with

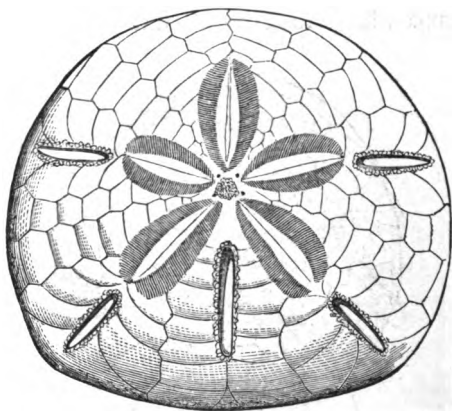


The Cake-Urchin.

a star-shaped figure in the centre. It is called the Cake-Urchin, and sometimes the Sand-Cake. Here is a picture of it. It looks very much as the common sea-urchin would if it were much flattened,

only its spines are very short and fine, instead of being long, strong, and sharp, like the spines of the common sea-urchin. The picture shows it as it looks with most of the spines removed.

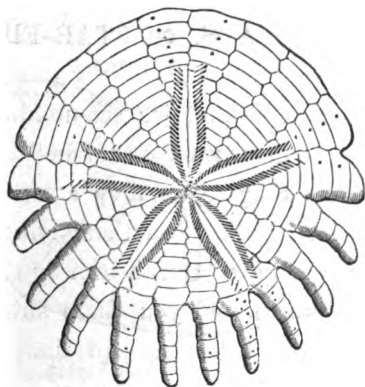
The Cake-Urchins like to live in the sand, while common sea-urchins like to live in the little nooks among the rocks.



The Mellita, or Key-hole Urchin.

On the southeastern coast of the United States you may find the curious sea-urchin whose picture you see here. It is shown as it looks when the spines are removed. It is flat, somewhat like the

Cake-Urchin, but it is not round ; it looks as if a piece had been cut from one side ; and there are five long slits or holes through it, towards its edge. What these five holes are for no one has yet been able to discover ; but we may be sure that the Creator made the animal of this form for a good and wise purpose. The name of this curious sea-urchin is *Mellita*. It is also sometimes called the Key-hole Urchin.



The *Rotula*, or Wheel-Urchin.

On the coast of Africa there are Sea-Urchins which have many cuts or deep notches in the edge of the shell, instead of a few holes, and so, on

one side, at least, they look much like a wheel, and they have been called the Wheel-Urchins, or Rotulas.

One of the most curious things about sea-urchins is, that some kinds of them are able to burrow or make holes in almost all kinds of hard substances; some kinds even make holes in solid rocks, and they are often found living in the homes which they have thus made for themselves.

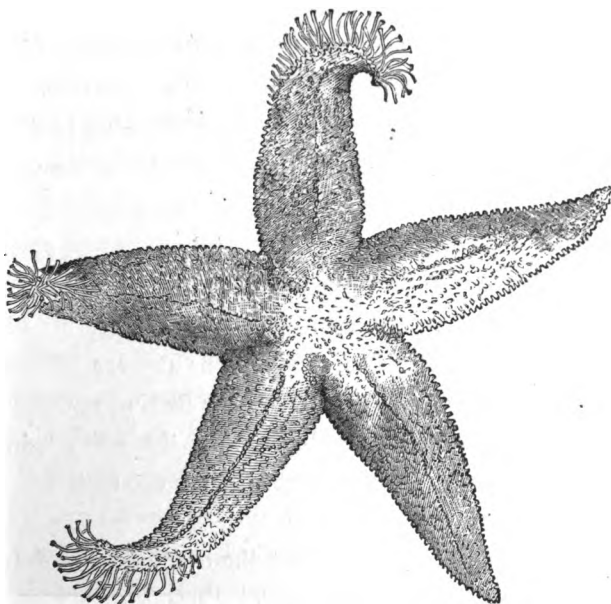
THE SEA-STARS, or STAR-FISHES.

WHEN you are looking for sea-urchins you will be sure to find a great number of Sea-Stars, or Star-Fishes, or Five-Fingers, as they are often called. You will also very often find them lying upon the beach where they have been thrown by the waves.

As I have before told you, these animals are in no way like true fishes, except that, like those animals, they live in the water; but they keep the last part of their name, because it was given to them a long time ago, and because it is now hard to change it.

Star-Fishes are of all sizes, from those that are

not so large as your hand to those that are twice as far across as the top of a man's hat; and they have many different forms. Some kinds have five



The Star-Fish, or Sea-Star.

arms, and some have ten, and some have very many more than ten; and some kinds have the arms very slender, and others have them very broad; and some kinds have the arms so broad,

and joined together in such a way, that they seem to have almost no arms.

And Star-Fishes are of various colors; in the same pool you may find some that are brick-red, others that are crimson, others that are purple, and others that are of the color of an orange.

In a furrow, or groove, under each arm of the Star-Fish there is a large number of tubular organs, like those which the Sea-Urchin has, and of which I have before told you. These tubes may be seen in the picture on the previous page, where the star-fish is shown with the upper or back part turned towards you, and three of the arms or rays turned backward so as to show the tubular feet, or suckers. The mouth is on the under side of the animal, in the centre, and there is a sort of an eye at the tip end of each ray or arm.

You must not suppose that the eyes of a star-fish are at all like yours; they are very poor eyes when compared with yours, and a star-fish cannot see so much with all of his five eyes as you can see with one of yours, even when it is half shut. But they are as good as a star-fish wants or needs, and so we will not pity him because his eyes are not

just like ours. Star-Fishes do not have to go to school, nor read books, nor study, nor sew, nor do any sort of work. All they have to do is to crawl about in the sea, or cling to the rocks, and catch and eat their dinners; and their eyes are good enough for all of these purposes. When you see a live star-fish I want you to look for his eyes, and see if you can find them. If you do not find them, some one who has carefully studied star-fishes will help you find them.

By means of their tubular feet, or suckers, they can crawl on the bottom of the sea, and on seaweeds, and on the surfaces of the rocks. They can move up the steep surfaces of rocks, and along the underside of overhanging rocks, without any danger of falling. They cling to the rocks very firmly, and will often suffer their suckers to be torn off rather than to let go their hold. The covering of star-fishes is not solid, and so they can bend their arms in any and every direction, and thus they can work their way into cracks or fissures, and other holes in the rocks.

On the back of the Star-Fish, near where two of the arms branch off, there is a very curious little

spot; it looks somewhat like a little piece of coral, and so it is called the madreporic body, from one kind of coral which is called madrepor. It is the same kind of a body which you may see upon the top of a sea-urchin, and I have told you about it in what I have said of that animal. This body is a sort of sieve which filters the water that goes into the water tubes in the inside of the animal, some of which are connected with the tubular feet, and supply them with water, so that they may be firm enough to be extended. Not all of the water, however, which goes into the animal enters through the sieve; water also goes in through a great many minute pores which are scattered over the whole surface of the animal. When star-fishes are in the water they are very full and plump; but as soon as you take them from the water they begin to shrink, because the water passes out through the pores of which I have just told you.

Star-Fishes, as well as sea-urchins, have the curious organs called *pedicellariæ*, and these are clustered around the spines on the upper side of the body. These organs have only two prongs, instead

of three as in sea-urchins. What use the star-fishes make of these organs is not known ; but we may believe that they serve some important purpose.

The mouth of the Star-Fish has no teeth, but it is surrounded by a tube or ring.

Star-Fishes lay eggs, from which the young are hatched ; and it is interesting to know that they carefully guard their eggs, bending around them, and protecting them with their suckers, and even carrying them as they move about. If you take the eggs from a star-fish and place them at some distance from the animal, it will sometimes go to the eggs and take them and move off with them.

When the young star-fish first hatches from the egg, its form is very different from that of the full-grown animal. It is then not only very minute, but it is nearly egg-shaped in form, and has no arms, but it is able to swim freely about in the water by means of the many cilia or little hair-like organs with which its body is covered. Even when the young star-fish has ceased swimming freely about, and has become in shape like its parent, it is not so large as the nail on your little finger.

After you have carefully watched the Star-Fishes in the pools left by the tide among the rocks, you may get a living star-fish and put it on its back in a basin of clear sea-water, and you will then have another good opportunity to see how it uses its tubular feet. At first it will lie still,—perhaps because it is frightened,—with its tubular feet all drawn into its body ; but if you wait patiently, these organs will soon make their appearance, and move freely in different directions, as though they would take hold of something ; and by and by some of them bend over and fix themselves to the bottom of the basin, then others do the same, and then contracting they pull the star-fish towards the place where they are fixed, and soon they turn it over into its true position, with the mouth downward.

Star-Fishes feed upon oysters, clams, sea-snails, and all other sea-animals which they can get ; and they have a very curious way of feeding. Grasping an oyster, clam, or other animal with their arms and suckers, they turn their stomach out of the mouth and over the animal, and in that way suck out the food and devour it. Sometimes they do very great damage to oyster-beds, eating the oysters in immense numbers.

If you gather star-fishes at Nahant, or on any other rocky coast, you will find many of them which have one or more of the arms much smaller than the others, and perhaps you will wonder how this happens to be so, and I will tell you. Star-Fishes very often lose an arm or two; sometimes the arm is broken off by the dashing of the waves, and sometimes it is bitten off by a hungry fish; but in nearly all cases another arm sprouts out and grows in the place of the old one. As it begins to grow later than the others, of course it is always a little smaller than they are. Sometimes two or three of the arms get broken off; then the two or three arms which sprout out are always smaller than the others. And even if all the rays but one be broken off, that one will live and four new arms will grow, so that the star-fish will again have five rays! If you ever have an aquarium in which you can keep star-fishes, and if any of your star-fishes have an arm broken off, you may perhaps learn how soon the new arm sprouts out, and how fast it grows.

You will remember that star-fishes are not the only animals whose parts grow again when they are broken off. You will remember that I told

you, in the book of Reptiles and Fishes, that when the salamanders lose a leg, or even an eye, another grows in its place; and that I told you, in the book of Insects, Crustaceans, and Worms, that if a crab, or a lobster, have a claw broken off, another soon grows again,—the new one being always smaller than the other.

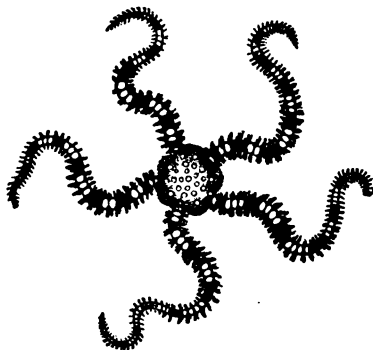
Thus God has so made these little animals that they are not destroyed by being bitten by fishes or by being broken when dashed against the rocks by the waves.

There is one kind of star-fish that is so large and so wonderful in its habits that I must tell you about it, although it is not found on the sea-coast of our country, and perhaps you may never see it. It lives on the coast of Great Britain, and is called *Luidia*. When it is full grown it is two feet across! The rays are very flat, and they taper gradually, and the eye at the end of each ray is in the centre of a circle of spines. Its color is red above and yellow below. The *Luidia* has the wonderful habit of casting away its arms entire, or of breaking them into many pieces whenever it is excited or alarmed. A gentleman once caught one of these star-fishes

and spread it out upon one of the seats in the boat; when he would take it up to carry it home and preserve it, he found that the star-fish had broken itself into many pieces. The gentleman was very sorry; for he had never seen the *Luidia* before, and he was very anxious to have a good specimen of it for his cabinet, and now he could have only fragments. The next time he went to hunt for the *Luidia*, he took with him a bucketful of cold fresh water from the well; for he thought that if he could only get the star-fish into the cold fresh water, the water would stupefy or kill it before it would have time to break itself to pieces. So when he had brought up nearly to the top of the water a fine specimen of the *Luidia* in his dredge,—a sort of net with which to get animals from the bottom of the sea,—he sunk his bucketful of water to a level with the mouth of the dredge, that he might quickly remove the star-fish from the dredge to the bucket; but before he could do this, the *Luidia* broke itself into many fragments, and escaped through the meshes of the dredge. The gentleman was able to grasp and save only the end of one arm.

THE SERPENT-STARS, OR OPHIURANS.

WHEN you are looking for sea-urchins and star-fishes on the sea-coast, you will sometimes find the curious Serpent-Star, whose picture you see upon this page. Animals of this kind are often



The Serpent-Star, or Ophiuran.

called Snake-tailed Star-Fishes, because they look a little like the common star-fishes, and because their arms taper to a point like a snake's tail. The name Ophiuran means snake-tailed. These animals are also often called Brittle-Stars, because

they so readily break themselves into pieces when excited or alarmed.

The Serpent-Stars are quite different from the star-fishes in form, for their arms start off abruptly from the disk, or central part, as you can see, while the arms of the true Star-Fishes gradually taper from the disk or central part, so that you cannot tell where the disk ends and the arms begin. If you will look at the Serpent-Star, and then at the Star-Fish, you will understand what I mean.

The Serpent-Stars look very much like a little sea-urchin, with long and spiny arms.

The Serpent-Stars have no tubular organs or suckers like those of sea-cucumbers, sea-urchins, and star-fishes, and so they move about by means of their arms and spines; and this is the reason why they are often called Spinigrades or Spine-Walkers.

The arms of the Serpent-Stars are not hollow, like those of the star-fishes, and so there is no place in them for any of the internal organs; these are wholly contained in the central body, or disk.

The Serpent-Stars have five arms only; they thus differ in this respect from the star-fishes, which in

some cases have more than five arms, although most kinds have only five.

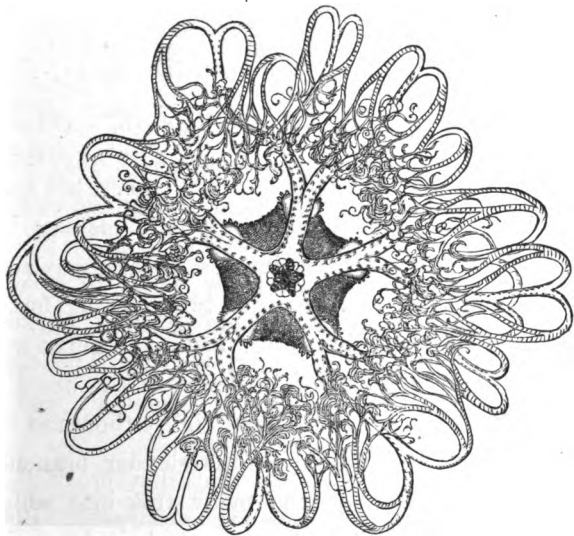
The Serpent-Stars are very shy animals, and they get into the darkest corners and holes which they can find among the rocks, and you will have to look very sharply to find many of them. But you can find them if you look carefully enough. Although they seem not to have any eye-specks, they know when you come near them, and try to hide away as soon as you attempt to catch them.

The cod and haddock know where to look for serpent-stars, for when they are caught their stomachs are often found to be full of them. This shows us that these little animals are useful as food for fishes that are of great use to man.

I have already told you that they break themselves into pieces when excited or alarmed. But if all the rays are broken from a disk, others will grow to supply their places.

There are very many kinds of Serpent-Stars, and they vary greatly in size and appearance. Some kinds have their arms as you see them in the picture which I have shown you, and others have the arms very long and very slender and somewhat thread-like.

But there is one kind of the Serpent-Stars that is more wonderful than all of the others. It is called the Basket-Fish. It is also called the Astro-



The Basket-Fish, or Astrophyton.

phyton, which means star-plant. In Europe it has been called the Shetland Argus, and Medusa's Head.

This strange serpent-star lives in the deep water on the coast of New England, and in other cool

parts of the Atlantic Ocean ; and it sometimes gets entangled in the lines of the fishermen, and is thus brought up from its deep home, and we are allowed to see it and to study its wonderful form and structure.

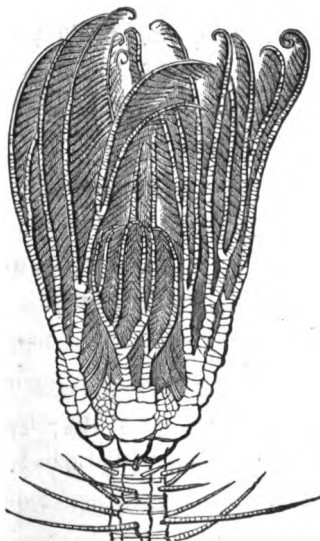
By looking at the picture of the Basket-Fish, you can see that its arms are very much divided as they grow longer. Where the arms start out of the body they are only five in number, but each one of these soon divides into two, making ten in all ; and each of these into two, making twenty in all ; and each of these into two, making forty ; and each of these into two, making eighty ; and so on till the number of branches in the arms of the Basket-Fish are more than eighty thousand !

The Basket-Fish moves on the slender branches of its rays, resting on the many tips into which these are divided. When disturbed it turns its arms towards the mouth, and then looks very much like some kinds of basket.

The Basket-Fish is a hungry animal, and when little fishes, shrimps, sea-snails, and other small animals get among its arms, it is sure to make a meal of them.

THE CRINOIDS, OR LILY-LIKE ANIMALS.

THE animal whose picture I show you on this page looks a little like a basket-fish with a stem.



The Medusa's Head, a Crinoid.

But it also looks so much like a plant that it has been called the Crinoid, a name which means lily-like. Only a few kinds of crinoids are now living,

and only one kind now living has a stem when it is full grown. This one lives in the sea, near the West Indies, and it has a stem about a foot in length. It has been named the Medusa's Head.

But Crinoids with a stem are very abundant in the rocks, and thus show us that they were very numerous long ago when the places that are now dry land were covered by the ocean. Those found in the rocks are called Stone-Lilies, and their stems and curious bud-shaped or flower-shaped tops are very beautiful and very interesting objects.

The stems of crinoids are hollow, and are made up of many pieces or joints. Those found in the rocks were once called St. Cuthbert's Beads, and they are sometimes called so now; and I think you will like to know how they came to have that name. Long ago, in a country far across the ocean, there lived persons who found, upon the sea-shore, many round pebbles with a hole in the middle, and who believed that these pebbles were true beads which a good St. Cuthbert, living on a little rocky island, had made for them to use as rosary-beads. They believed that

“On a rock by Lindisfarn
St. Cuthbert sits, and toils to frame
The sea-born beads that bear his name.”

But I must tell you that there never was any St. Cuthbert who made the beads, and that the beads were only the water-worn joints of crinoid stems; the joints had been washed out of the rocks, and smoothed by the waves on the sea-shore.

On the coast of Europe there is a kind of crinoid called the Rosy Feather-Star. It is also called the Comatula. It has five arms, each one of which is divided into two, which are long and tapering to the end, so that the crinoid looks as though it had ten long arms. On each side of each of the ten arms or branches are jointed slender organs called pinnæ—making the arms look a little like a feather—and each pinna has about twenty-four joints and a claw of five or six finger-like hooks at the end. The color of the Rosy Feather-Star is rosy red, dotted with brown. It moves about freely in the water, and looks somewhat like a serpent-star.

Like the serpent-stars, the Comatula, or Feather-

Star, has the strange habit of breaking itself to pieces whenever it is alarmed or excited.

But the most curious thing about the Comatula, or Feather-Star, remains to be told. When young, it has a stem and is fixed to the bottom of the sea, like a plant; or just like the stemmed crinoid whose picture I have shown you; but as it grows older it drops from its stem and floats away as a free crinoid, and is then the beautiful Rosy Feather-Star.

For many years it was believed that the Comatula upon its stem was a full-grown animal, but the star on the top of the stem has been seen to break off and swim away; so that it is now known that when the Feather-Star is young it has a stem which is fixed to some object in the sea.

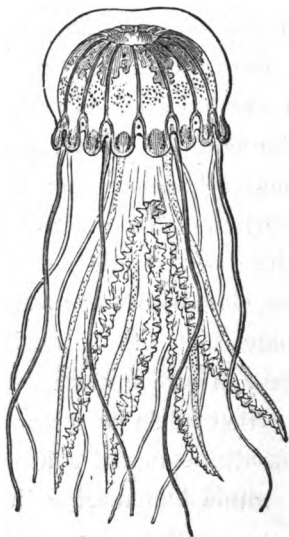
So you may remember that there is one kind of crinoid which has a stem all of its life; and that there is another kind which has a stem only while it is young, and that it drops from its stem and moves freely about when it is full grown.

The Rosy Feather-Star is not found close to the shore; it lives in rather deep water, but it has been captured by means of a dredge, and then

it has been placed in an aquarium, so that its movements and its habits could be observed. It is found to be quite an active little animal, when it chooses to move about; sometimes it crawls along quite rapidly over the stones and sand on the bottom of the tank; at other times it swims about in the water, turning in whatever direction it pleases. It is said that in the sea it sometimes clasps sea-weeds, or some other floating object, and is thus carried about without any effort of its own. In the aquarium the Feather-Star sometimes rests upon a sea-weed or upon a rock, grasping it so firmly with its little hooked claws, that it is not easy to take it from its resting-place. And it is said that when a person tries to take up one of these little animals, it will grasp any object that is within the reach of the tips of its arms. When the Feather-Star is resting, it often remains a long time in one spot, bending the tips of its arms upwards, and now and then gently waving them.

When you are at the seaside, or when you are upon a steamboat or other vessel on the ocean,

you will sometimes see many curious jelly-like objects floating or moving near the surface of the water, and you will often find large, soft, jelly-



A Jelly-Fish.

like objects lying upon the sand when you go to walk on the sea-beach. These curious objects are called Jelly-Fishes. They are also called Acalephs, or Sea-Nettles.

These animals are so curious and so beautiful

that I am sure you will like to have me tell you a little about them ; and first I will tell you why they have been called jelly-fishes, and why sea-nettles.

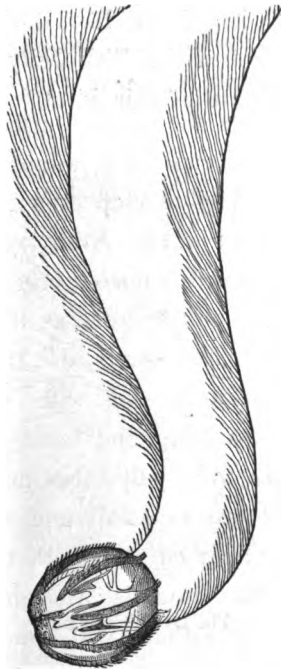
They are called Jelly-Fishes because their body is soft like jelly, and because they live in the water. You must not think that they look like true fishes, of which I have told you in the little book about Reptiles and Fishes, or that they are formed like them. They are in no way like true fishes, except that like those animals they live in the water.

Their soft, jelly-like body is usually of a rounded form, with fringes, or tentacles, as you see them in the picture of a Jelly-Fish, on the opposite page.

They are called Sea-Nettles because, when they touch our flesh, they produce a smarting pain, somewhat like that caused by handling the nettle-plant. These wonderful animals are also often called the "Lamps of the Sea," because at night they give out a bright and beautiful light. You have read in your little book of Mollusks, that some kinds of those animals have the power of shining with a light so bright that the water around them is illumined to the distance of several feet, and that

the fishes and other animals which are swimming near these shining mollusks can be plainly seen. But the sparkling and shining light, or phosphorescence, of the sea is caused mainly by the multitudes of little jelly-fishes, or sea-nettles, which are floating and swimming near the surface of the water. Sometimes the whole surface of the sea, as far as the eye can reach, seems to be lighted up, and the path of a ship or a boat is marked by a bright line of light. Even the slightest disturbance of the waves causes a bright flashing and sparkling of light, and the oar as it is lifted from the water sometimes seems as though it were dripping with pearls and with melted silver. This brilliant, sparkling, and most beautiful light of the sea comes from jelly-fishes and other kinds of animals that are so small and so transparent that they can hardly be seen with the naked eye: When these little animals are alarmed or disturbed in any way, either by the motion of a ship or by the breaking of the waves, the light which they give out shines more brightly. If the hands are dipped in the sea-water and then rubbed together, in the dark, they are sometimes seen to be covered with bright spots.

There are some kinds of jelly-fishes which have a globe-shaped or a melon-shaped body, and which

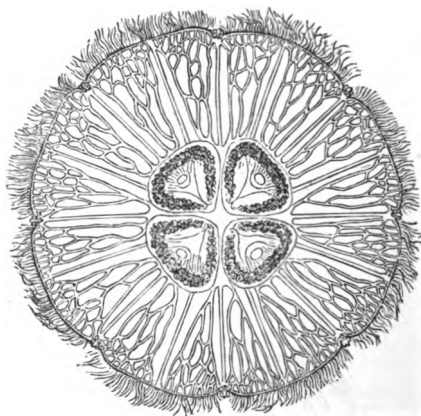


A Comb-bearing Jelly-Fish.

have along their body eight rows of fringes ; these rows of fringes are called combs, and so these an-

imals are called the Ctenophoræ, which means Comb-bearers.

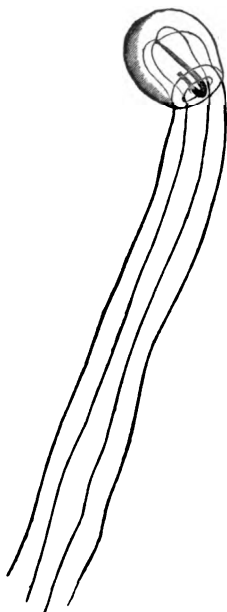
Other kinds of Jelly-Fishes have the body somewhat umbrella-shaped, or like a shield or disk, and these are called the Disk Jelly-Fishes. Here is a picture of one of this kind.



The Disk Jelly-Fish.

There are other kinds of Jelly-Fishes, some of which look like plants all of their lives, and some of which look like plants when they are young, but which when full grown look like the common

Jelly-Fishes. They are called Hydroids, a name which means like a hydra.



A Hydroid Jelly-Fish.

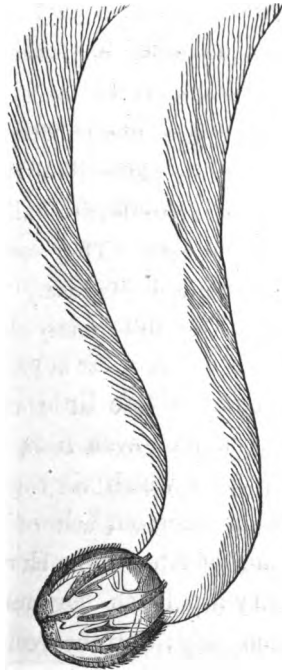
Now I think you will like to know more about these different kinds of jelly-fishes, and so I will tell you something about each kind, beginning with the Comb-Bearers.

THE COMB-BEARING JELLY-FISHES, OR CTENOPHORÆ.

As I have before told you, these jelly-fishes are more or less globe-shaped, or egg-shaped, and on the body there are eight bands, or rows of fringes, which look a little like the teeth of a comb, and so these animals are called the Ctenophoræ, or Comb-Bearers. They are also sometimes called the Beroid Medusæ, from Berœ, a name which was in use many hundred years ago.

There are many kinds of these jelly-fishes, and several kinds are common on our sea-coast. Here is the picture of one called the Pleurobrachia, which is common on the coast of New England. Besides its rows of fringes, it has a pair of the most remarkable organs, or tentacles; and when the Jelly-Fish is active, these constantly change their length, their form, and their colors, so that the varied and graceful movements of the animal and the ever-varying forms and rainbow hues of its tentacles present a most beautiful appearance.

The fringes, of which I have told you, are in motion nearly all the time ; and it is believed that they



The Pleurobrachia.

are all of the time under the control of the animal ; and that it can wholly stop their movements, or

make them move slowly, or rapidly, as it pleases ; and that it can stop the movement of a part of the bands, while the others are in motion ; and that it can stop the movement of a part of the fringes in one of the bands, and keep the rest of the fringes of that band in motion. It is by means of these fringes that the *Pleurobrachia* is enabled to move through the water, and to perform its almost endless and very graceful movements.

The tentacles of the *Pleurobrachia* are such curious organs, that I think you will like to know a little more about them. The animal can lengthen them so that they stretch out very far beyond the body, or it can draw them up into little balls, one on each side of the body, or even hide them in the two little cavities from which they grow. Sometimes these tentacles hang out below the body only for a little way, and look much like slender threads. At other times they are much lengthened, and extend far beyond the body ; and then other and more slender threads are seen to start off from one side of each tentacle, and unfold themselves so that the tentacles are fringed for their whole length in the most delicate manner. Sometimes the tentacles

are stretched out far above the body of the jelly-fish; sometimes they trail behind in the most varied and graceful curves; sometimes the little creature stretches out and then draws up these delicate organs in quick succession; and sometimes one of the tentacles is extended far beyond the other.

The Idyia is another beautiful jelly-fish, which belongs to the comb-bearers, and which lives in the northern parts of the Atlantic Ocean, and which you may often see at Nahant and at other seaside places. The Idyia is three or four inches long, and is of the most beautiful rose-color. It sometimes appears in such great numbers, in summer, that it tinges large patches of the sea with a delicate rosy hue.

The Idyia and all other ctenophoræ are very hungry animals. They are so soft and so delicate, you would not suppose they would need much food, but they as highly prize their dinners as do any other kinds of animals; and they swim through the water with their very large mouth wide open, and they swallow all the little animals which they can catch, and they are especially fond of catching and eating ctenophoræ themselves.

THE MEDUSÆ, OR DISK JELLY-FISHES.

THESE jelly-fishes have a body which is broad like a disk, or somewhat umbrella-shaped, and they have either short or long tentacles or fringes.

Their body is nearly transparent, and consists almost wholly of water. There is so little solid material in the body of one of these animals, that a jelly-fish of this kind which weighs many pounds when alive, weighs only a few grains when dead and dry. When it is perfectly dry, only the thinnest skin is left upon the spot where the thick and heavy animal was placed.

The Medusæ, or Disk Jelly-Fishes, are very beautiful. They generally float near the top of the water, and move slowly along, by expanding and partly shutting their umbrella-like body.

The Medusæ live together in immense numbers, and the sailors, and those who have travelled over the sea, have told us of the vast schools or fleets of these animals which they have seen upon its surface, and which seemed to extend as far as the eye could reach ; and sometimes, when sailing in the

warm waters of the tropical regions, where jelly-fishes are much more numerous than they are in the cooler waters of the temperate and cold regions, a vessel, after passing through a fleet of one kind of these wonderful little animals, soon finds itself surrounded by a fleet of another kind of them. At such a time, the sight presented is exceedingly beautiful. By day, the bodies of these curious creatures reflect in the sunshine all the colors of the rainbow; and at night the sea glows with the bright phosphorescent light of which I have told you.

Dear Amy and Sanny will remember the great numbers of disk jelly-fishes which we saw this summer in one of the little coves at Nahant, and how beautifully they looked in the bright sunshine.

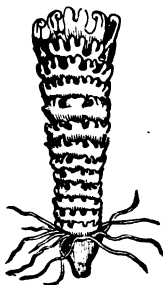
But I must tell you about the young of the Medusæ, or Disk Jelly-Fishes; for they do not look like their parents, nor do they swim freely about in the water like them, but they are fixed to some object in the sea, and for a time they look, and seem to grow, like little plants.

The eggs of many kinds of the Medusæ hatch into very minute creatures, which swim about in

the water for a time by means of the delicate cilia with which they are furnished. But soon each little animal becomes attached to a rock, or to a shell, or to sea-weed, or to some other object in the sea. The young and tiny jelly-fish keeps on growing, and by and by little arms or tentacles are seen around the upper or unattached part of the



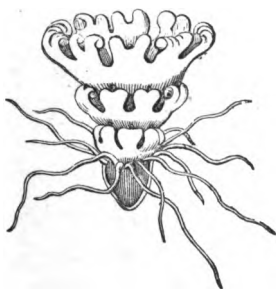
animal. Here is a picture which shows you how it looks at this time of its life. As the body grows



A Strobila.

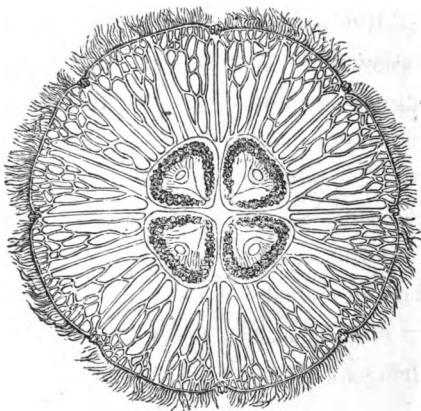
upward, and gets to be longer, it seems to become wrinkled or folded, and looks somewhat as it would

if a number of threads had been tied around it, one above the other. These folds or wrinkles become deeper, and soon their edges are seen to be notched, and the little being looks as you see it in the picture. It is now called Strobila. The upper divisions of the body grow broader, and the folds, or rings, grow still deeper, and the notches are more prominent, and look, as you see them in this



picture, somewhat like notched saucers standing one above the other. At last the upper saucer or disk breaks off, turns over, and floats away; and then, after a while, another disk breaks off, and floats away; and so on, until all the disks or saucers are floating and swimming in the sea. Each one of these disks soon becomes a jelly-fish like its parent. Thus

a single young plant-like being, which comes from a single egg of a jelly-fish, becomes a strobila, and this after a time divides into many parts, each one of which becomes a perfect jelly-fish. Here is a pic-



The Sun-Fish, or Aurelia.

ture of one of these jelly-fishes in its full-grown or perfect form. This kind is often called the Sun-Fish ; but its true name is Aurelia.

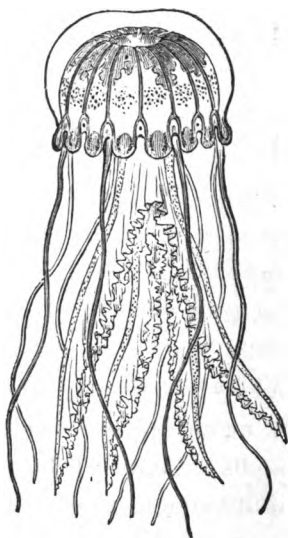
You must not think that the young jelly-fishes are as large as are the pictures of them which I have shown you. The pictures are made much larger than the animals really are, so that you may

see their forms better than you could if they were made of the true size of the creatures themselves. Each little sun-fish, when first seen in the early days of spring, is hardly a quarter of an inch across; but it grows very rapidly, and in a few months it reaches its full size, and is then nearly a foot across. Soon after it has reached its full size, and having laid its eggs, it dies. The eggs soon hatch, and the young swim freely about for a time, but after a while each becomes attached to a rock, shell, sea-weed, or other object, as I have before told you.

On the edge of the disk of the Aurelia you may see eight slight notches, and in these notches there are no fringes; there the eyes are situated.

The largest and most magnificent of all the Jelly-Fishes which are seen in the sea near our country is the Cyanea. Sometimes this jelly-fish grows to be six or eight feet across, — as broad as a very large table; and the tentacles of one of these large ones are sometimes a hundred feet in length! The color of the disk is purplish red, with the margin bluish white, and the tentacles vary from orange to deep purple. The Cyanea floats near the

surface of the water, and drags its enormously long tentacles behind it, and it captures every little animal that gets entangled in them. This enormous jelly-fish comes from a little plant-like being like that from which the Aurelia comes, and in the manner that I have explained to you.



The Pelagia.

In the Atlantic Ocean, near Florida, there are jelly-fishes like the one whose picture you see upon

the opposite page, and whose name is Pelagia,— a name which means belonging to the sea. The Pelagia is twice as large as its picture which I show you, and it is a very beautiful jelly-fish. It differs from the Aurelia and the Cyanea in the way in which it grows from the young state, for it grows directly from the egg, and at no time of its life is it attached to the bottom of the sea like a little plant.

I have already told you that jelly-fishes are often called Sea-Nettles, because they produce a stinging when they touch the hands, arms, or body of a person. When swimming or bathing in the sea, persons often come in contact with these animals, and sometimes suffer great pain from their stinging powers. Perhaps you would like to know how they cause this stinging, and I will tell you. On the tentacles there is a large number of very small cells. They are called lasso-cells. Coiled up in each cell there is a long thread-like organ, finer than any thread which you ever saw, or can see with even your sharp eyes; they are only seen by the aid of a microscope. The jelly-fish can quickly uncoil and throw out these tiny threads whenever it wants to, and

whatever animal they touch they sting. It is by means of these tentacles and these lassos that jelly-fishes secure their prey.

THE HYDROID JELLY-FISHES.

BEFORE I tell you about the Hydroids, I will first tell you about the Hydra itself.

The Hydra is a very small fresh-water animal, scarcely an inch in length, which is found fixed to plants, sticks, and other objects in ponds, pools, and slow-moving streams. Its form is like that of a long sac or tube, with an opening or mouth at the free end, and around the mouth are long arms, or tentacles. The tentacles float loosely in the water, and if any minute animal touches them they quickly seize it and carry it to the mouth, and it is soon swallowed.

The name of the naturalist who first carefully observed the Hydra is Trembley, and he has told us many very curious and very wonderful things about them. Once he saw two Hydræ seize the same little animal; each Hydra held tightly to

the prey, and so, as one Hydra was larger than the other, the larger one swallowed the smaller one and also the little animal to which both were clinging. They both kept on eating the little animal, and when it was all digested, the larger one released the smaller, which seemed to be as well and active as if it had never been swallowed !

The Hydra has the most wonderful power of repairing itself when it gets injured. If it lose any of its tentacles, others grow in the place of the lost ones. If its body be cut across in the middle, each half forms a perfect hydra, and if it be cut across so as to form thirty or forty pieces, each piece becomes a perfect animal like the hydra before it was cut. And if it be cut in two lengthwise, each half becomes a hydra ; and even if it be cut into strips, each strip soon becomes a perfect hydra with its own mouth and tentacles !

By cutting a slit in the Hydra near the end, another head will grow, and thus as many heads will grow as there are slits made ; nor is it believed that the cutting of the hydra gives it pain. Two hydras may be joined, and thus made to grow tightly together so as to become one compound animal.

But the most wonderful thing about the Hydra is, that if it be turned inside out, it lives, and eats, and grows, as well as before !

When the Hydra wishes to move from one place to another, it bends forward until its head touches the surface on which it wishes to move, and there fixes itself by means of its tentacles ; now it releases its foot, and draws it up close to the head, and there fixes it. Then the tentacles let go, and the body again bends forward, and the head is fixed to the surface as before ; and then the foot is released, and again fixed near the head ; and this is the way it moves from place to place.

I will now tell you about the Hydroids, little jelly-fishes that are even more curious and more wonderful than any of those of which I have before told you. I am sure you will like to read and to know about them. They live in every ocean and in every sea.

Hydroids in their young state live in clusters ; and some kinds live in clusters all their lives. In nearly all cases the clusters are attached to rocks, shells, sea-weeds, or other objects in the sea, and

look so much like little plants that you would be almost sure to call them plants if you were to see them. And some kinds of hydroids are so small that a cluster containing many of them looks like a mere discolored spot or patch on the sea-weed, stone, or shell. In many kinds the clusters look like minute mosses or miniature shrubs.

Here is a picture of a cluster of hydroids growing upon a sea-weed. See how like a little cluster of



The Coryne, or Sarsia, growing in a cluster on sea-weed.

delicate mosses it looks. The name of this kind of hydroid is Coryne, which means a club. It is also called Sarsia, in honor of a Norwegian naturalist whose name was Sars, and who carefully observed these strange animals, and who has told us much about them.

The pictures of hydroids and of all other jelly-fishes, in this little book, are drawn after the splendid pictures in the large books of Agassiz, the great naturalist.

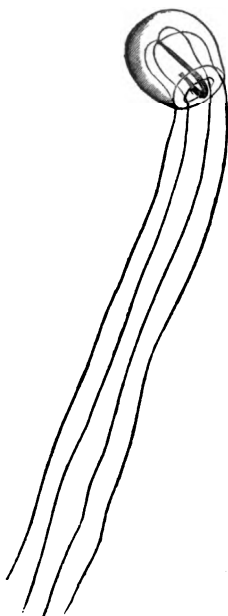
Here is one hydroid, taken from the little tuft which I have just shown you, and enlarged so that



A single Hydroid much enlarged, showing *a* and *b* just ready to drop off and become free medusæ, or jelly-fishes; *c* a bud not full grown.

we may see what is taking place. After what I have told you about the Aurelia, or Sun-Fish, perhaps you begin to think this little tuft has something to do with jelly-fishes; and so it has. The eight club-shaped organs, which you see standing

out around the top, are the tentacles. But the little egg-shaped bodies that you see there are buds attached to the main stalk, and which, when ma-



The Coryne, or Sarsia.

ture, drop off and float away, and become free jellyfishes, just like the one whose picture you see upon this page, and which shows you the Coryne, or Sar-

sia, when it is full grown. The buds marked *a* and *b* are as they look when just ready to break off and float away, while *c* is shown as a bud which is not yet full-grown.

The full-grown Coryne is bell-shaped, and has four long tentacles; and hanging down from the inside of the body there is a hook-shaped organ on which the eggs are carried. This little animal has hardly more substance than a bubble or a dew-drop, but neither a bird nor a butterfly can move about more actively, or make more varied movements in the air, than can this bell-shaped little jelly-fish in the water.

The Coryne lays its eggs into the water, and when they hatch they grow into the little clusters whose picture I have shown you on the eighty-third page.

The Tubularia is another little hydroid which, perhaps, you will find growing on a shell or stone, when you are looking in the pools where I have told you to search for sea-urchins, star-fishes, and the other curious little sea-animals whose pictures I have already shown you. It looks like a little tree with roots, stem, and with branches and clusters of

fruit at the top. But those clusters are little hydroid jelly-fishes, which live and grow as they are



The Tubularia.

shown in the picture, and do not drop off and swim away as do the Sun-Fish and the Coryne of which you have just been reading.

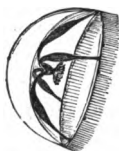
The Campanularia is another hydroid, which I hope you will some time see. It looks very much

like a little plant, and has two kinds of buds or bell-shaped cups as you see them in the picture ;



The Campanularia. The bodies in the bell-shaped cups drop out and become free jelly-fishes, much like Tiaropsis.

one kind with tentacles, and one kind without. In the one without tentacles you may see many little bodies, those nearest the opening of the cup or bell being larger than those near the bottom. After a while these little bodies drop out and swim away,



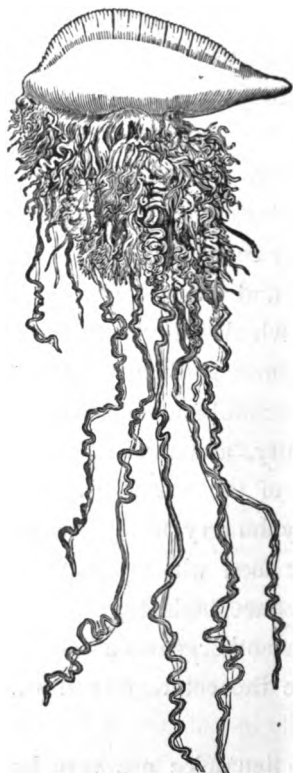
The Tiaropsis.

and each one becomes a free jelly-fish, that looks much like the Tiaropsis whose picture you see here.

In the Gulf of Mexico, and in the warm parts of the Atlantic Ocean, there live hydroids that are very different from any of which I have told you. Instead of being fixed to the ground a part or all of their lifetime, they are always free, and float or swim about on the surface of the water. On the next page there is a picture showing you a group or community of these curious hydroid jelly-fishes. This community consists of a thin and beautifully crested air-sac, and many organs or appendages of different kinds which hang down from the air-sac. The different parts perform very different sorts of work. The beautiful air-sac floats or holds up the whole community, and thus keeps it from sinking to the bottom of the sea, where perhaps it would be eaten up by hungry fishes. Other parts catch and eat all the food which the community needs ; other parts produce buds from which new groups are formed ; and other parts are swimming organs, and help move the community from one place to another.

Some of the tentacles are very long, stretching out behind the floating community for thirty feet !

This strange group of hydroids, which looks so



The Physalia, or Portuguese Man-of-War.

much like one jelly-fish with long tentacles, is called the *Physalia*, which means a bubble; it is also called the Portuguese Man-of-War.

The air-sac of the Portuguese Man-of-War is three or four, and in some cases five or six, inches in length; and its colors are very beautiful, being mostly rich shades of blue and purple; the fringe-like crest is often of a pink or rosy hue.

The stinging power of this strange jelly-fish, or group of jelly-fishes, is very great. It is said that when it is seized in the water it at once clasps the hand and fingers of its captor with its long organs, and thus clings firmly until removed, all the time causing great pain and suffering.

POLYPS are animals which look like flowers, and live in the sea. Any girl or boy who goes to the seaside in summer may find one kind of polyps called *Sea-Anemones* growing on and among the rocks beneath the water, sometimes singly, and sometimes in large patches of twenty, fifty, a hundred, or more together, and forming a flower-bed almost or quite as beautiful in its forms and in its colors as that of a garden.



A Polyp, — a Sea Anemone.



A Cluster of Polyps.

If we try to take sea-anemones from the rocks, we find that they cling very firmly with their broad base, which naturalists call the foot. They will even allow themselves to be torn apart rather than release their hold of the rocks. But if we carefully put our fingers under them, and work gently and slowly, we can at length remove them uninjured, and then we can put them in our aquarium, or in a basin of sea-water, and observe their form, and watch their curious movements, and learn much about their habits.

Sea-Anemones and other polyps have a long tubular or sac-like body, with an opening or mouth at the top, around which there is a row of fringes or tentacles; and sea-anemones have the body wholly soft. From the mouth there hangs a sac or stomach, open at the bottom, and through this opening the water and the food pass into the main cavity of the body. The main cavity of the body is divided into chambers by partitions which run from the centre to the outer walls of the body, and from the top to the bottom. And near the top of each partition there is a hole from one chamber to another. The tentacles or fringes are hollow, and connect

with the chambers. Therefore water can pass into the mouth and through the inner sac into the chambers, and from one chamber to another, and also out through the minute holes in the end of the tentacles.

When not disturbed sea-anemones and other kinds of polyps expand greatly, like a full-blown flower ; but when disturbed they close up and look more like a flower-bud.

Sea-Anemones and other polyps are hungry animals, and they eat sea-snails, shrimps, and any other little sea-animals which they can capture. They secure their food by means of their tentacles and lassos.

But perhaps you do not know what a lasso is ; although I have mentioned it before, I believe I have not explained it. It is a long rope which men use in South America and in other places in catching wild cattle. A man with a lasso rides on horse-back very rapidly after the cattle, and when near enough he throws it so skilfully that it fastens upon the head of one, and in this way it is secured.

Now the Sea-Anemones and other kinds of polyps

have no hempen ropes for lassos, but they have something which is far better than ropes for their use. On their tentacles, as well as on the tentacles of jelly-fishes, of which I have before told you, there are many minute cavities or cells, so small that they can be seen only by the aid of the microscope, and in each cell there is a spirally coiled thread, and this little thread can be darted out instantly, and fastened upon any little shrimp or snail that happens to be near, and which the Sea-Anemone or other polyp desires to eat; and so these little threads are called lassos.

Some kinds of polyps are long, slender, and have only eight tentacles, and these tentacles are lobed



A Polyp, — an Alcyonarian.

as you see them in this picture, which shows you one of these polyps as it appears when much enlarged. If it were drawn no larger than the animal

itself, you would not plainly see the little lobes or fringes on the tentacles. Such polyps are called Alcyonarians.

Other kinds of polyps are the Sea-Anemones, of which I have already told you something. They

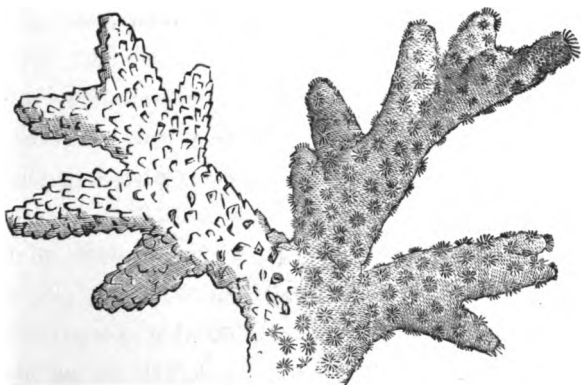


A Sea-Anemone, — an Actinarian.

have very many long, round, and smooth tentacles, as you see them in this picture. All kinds of polyps of this sort, that is, all kinds of sea-anemones, are called Actinarians.

Other kinds of polyps generally have twelve or more tentacles, and they form the beautiful hard corals which you have often seen. They live to-

gether in great numbers, and many of them grow and branch in the most beautiful manner. They are called by the long name of Madreporarians.



A branching coral with living Polyps on the right-hand branches, —
Madreporarians.

Perhaps you will now wish to have me tell you more about the Polyps, and so I will show you many pictures of them, and tell you some little stories which I hope you will like to read.

Polyps have been observed and studied for hundreds of years. Men studied some kinds of them even more than two thousand years ago.

The Sea-Anemones and some other kinds of

polyps are wholly soft ; but there are many other kinds of polyps which have hard parts called Coral. All of the beautiful clusters of coral which you have ever seen in Natural History Museums, and the beautiful Red Coral worn as ornaments, once belonged to living polyps.

Some people suppose that Coral is made by little insects, and they think that these insects are very industrious and that they work very hard to build up the large clusters of coral, and the vast reefs of coral which are found in many parts of the ocean, and which I shall tell you about by and by. But I want you to remember that the animals that form coral are not insects, and that in no way do they look like those animals. Insects, as I have before told you, in another book, have their body made up of rings or joints, and they have a true head, a middle body, and a hind body ; they have eyes, legs, and most kinds of insects have wings. But the animals that form coral are in nearly all cases polyps, and they are sac-like or flower-like in form, like the polyps whose pictures I have already shown you.

Please remember, then, that the animals which

form coral are not insects. Nor do the little animals that form coral work hard ; they do not toil to make the beautiful clusters of coral which you often see, and the vast banks or reefs of coral which are found in the warm parts of the ocean.

In your little body there are bones which make you strong and able to stand up, and walk and run and play. The horse and the ox, the cat and the dog, and all of the other four-footed animals, and all of the birds, reptiles, and fishes, also have bones in their body. These bones are called their hard parts, or skeleton. Insects have their hard parts, when these exist, upon the outside of the body ; crabs, lobsters, and shrimps have their hard parts upon the outside, and some kinds of worms have hard parts also on the outside. Most kinds of mollusks have hard parts, in the form of a shell, which is also outside. Sea-urchins and other spiny-skinned animals have hard parts which are also outside.

You will not think it strange, then, that many kinds of polyps have hard parts. But I must tell you that while their hard parts are not like the bones in your body, nor like those of the horse,

ox, or any other four-footed animal, they are in the inside, and not outside as in sea-urchins, mussels and clams, snails, nautili, shrimps, lobsters, and crabs.

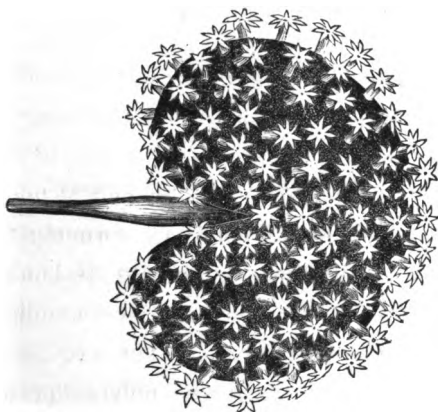
Coral is, then, the hard parts, or skeletons, of polyps, and it is formed much in the same way as the shells of sea-urchins, the shells of mussels and snails, the shells of lobsters and shrimps, and the bones of your own body, are formed; that is, coral grows in the bodies of polyps as bones grow in the bodies, or as shells grow outside of the bodies, of other animals.

All of the work which the polyps do, then, is to catch and eat their food.

THE SEA-PENS, SEA-FANS, &c., OR ALCYONARIANS.

THE polyps whose picture you see on the next page are called Renilla. They live together, forming a community. They are attached to a broad disk or leaf-like body, and this body has a hollow stem, or peduncle, as it is called, and by means of this

stem the whole community or group moves about on the sandy bottom of the sea near the shore.



The Renilla.

The Renilla lives on the coast of North and South Carolina and Georgia, and on the coast of South America. It is of the same size as the picture, and is of a reddish color, and is very beautiful when all the little polyps are fully expanded.

On the next page there is a picture of one of the little polyps of the Renilla as it appears when enlarged, so as to show its fringed or lobed ten-

tacles. It is the same one which I showed you on the ninety-fifth page.



A single polyp of the Renilla, much enlarged.

The Sea-Pens are groups, or communities, of polyps which are related to the Renilla, but which are shaped much like a feather, or a quill-pen, such as is used in writing. They are fixed in the sand or mud by their long stem, or peduncle, and perhaps they move about by means of it as the Renilla does.

The Sea-Pens are of a beautiful color, often purplish red, and orange, and some kinds of them are phosphorescent in the night, that is, they give out a bright light, especially when disturbed.

On the next page there is the picture of a branching coral which is found in the warm parts of the ocean, and which was formed by polyps, which look much like those that are standing up all over the leaf-like surface of the Renilla. This coral, as you

see, has a light-colored outside, which covers the dark central part somewhat as the bark covers the stem and branches of a shrub. The name of this coral is *Verrucella*.



The *Verrucella*.

Perhaps you have seen the beautiful Sea-Fans which coral polyps form in the warm parts of the ocean, and which sailors and others bring when they come home from their voyages to the warm regions. The Sea-Fans look somewhat like broad-leaved ferns, and when they are growing in the sea they are as beautiful as the

groups of ferns which you may see in the forest. The whole surface of the Sea-Fan looks like a network, as you see it in this picture, which shows a small portion of one of these interesting objects.



A portion of a large Sea-Fan.

In the sea near St. George's Bank, and also in the Bay of Funday, there are corals that are



The Primnoa.

much like the one whose picture I show you here, and whose name is Primnoa.

You have often seen the beautiful red coral which is cut and polished and worn in various ways as jewels; and I think you will like to know where it grows, and how it looks when it is growing, and how it is gathered.

The Red Coral lives in the Mediterranean and in the Red Sea, and looks when alive much like a little dwarfed shrub, as you may see by its form in this picture. It consists of a solid and



The Red Coral.

quite hard stem, or axis and branches, covered by living flesh, from which arise numerous polyps like so many flowers and flower-buds. The main stem and branches are red, but the polyps are white, and they look like beautiful white flowers.

This picture shows you one of the polyps as it appears when much enlarged.



The Red Coral, — one Polyp enlarged.

The gathering of red coral is called coral-fishery, and this fishery is sometimes carried on by means of vessels, and sometimes by boats, and sometimes by both vessels and boats. Each boat is manned by at least three men, and each boat is provided with a massive wooden cross. To the centre of the cross the men tie a very long and stout cord or rope, and on its arms they tie large and strong hempen nettings with coarse meshes. They sink the cross to the bottom of the sea by means of a very heavy stone, which they fasten to its centre; and then, while one man is constantly engaged in lifting the cross by the rope, and letting it fall again to the bottom, so as to break the coral from the

rocks, the others row the boat forward. Thus the cross breaks the coral from the rocks, and the coral is caught by the nettings as they are dragged along by the onward movement of the boat; and from time to time the cross and nettings are drawn on board the boat, and the coral stems and branches that have been caught in the meshes of the nettings are removed and washed and carefully saved.

Some time when you visit a Natural History Museum, you will see a rounded mass of coral, which is made up of very many long tubes and horizontal



The Organ-pipe Coral.

plates, as you see them in this picture, the whole being of the richest crimson color. As the tubes look like the pipes of an organ, this kind of coral

is called the Organ-pipe Coral. When it is alive and undisturbed, there is at the end of each tube a bright green-colored polyp, with eight tentacles.

THE TRUE SEA-ANEMONES, OR ACTINARIANS.

THE Sea-Anemone whose picture I here show



The Sea-Anemone.

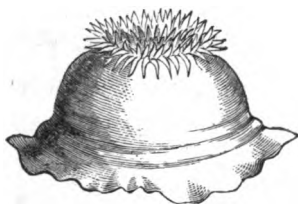
you used to live in a tank of sea-water in the Aqual Gardens on Bromfield Street, in Boston. One

day when it was open, or expanded, a gentleman made this picture of it. Then he touched the sea-anemone and it closed up, and then he made this



The Sea-Anemone, shut.

picture of it. Then he waited awhile, and when it began to open, and put out its tentacles, he made



The Sea-Anemone, opening.

this picture. So you see how sea-anemones look when they are expanded, how they look when closed or shut, and how they look when just opening.

As I have before told you, sea-anemones, or actinias, are wholly soft, and their tentacles are very numerous, round, and smooth.

The Sea-Anemone whose picture you have just seen is very abundant in the Atlantic Ocean, and at Nahant you may sometimes see hundreds of this kind in the shady nooks among the rocks, when the tide is low. At Mount Desert Island, in Maine, the rocks in some places on the bottom of the sea are covered with these flower-like animals.

Sea-Anemones feed upon sea-snails, bivalves, and all other little animals which they can capture. When a little animal comes within reach of their tentacles, these close around it, and, aided by their many lassos, they firmly secure it; and then it is gradually swallowed. By gently dropping a living sea-snail or any other little sea-animal upon their expanded tentacles, you may easily learn how they eat. Sometimes persons feed their pet sea-anemones with bits of raw beef; and you may also do so.

Sea-Anemones increase by means of eggs, and by buds. When the young are first hatched, they are somewhat egg-shaped, and they move about in the water by means of many hair-like organs or cilia;

after a time they become fixed to the rocks, and then they grow into the form of their parent. The buds are formed at the base by which the animal fixes itself to the rocks, and each bud soon separates from its parent and becomes a sea-anemone. Even if little pieces be cut from the base of the animal, each piece soon becomes a perfect sea-anemone !

In some countries Sea-Anemones are used for food, and when boiled in sea-water, or fried, are said to be very good.

Sea-Anemones are very beautiful objects for the aquarium. And as some of the children who read this little book may live near the seaside, or at least may go to the seaside in summer, and may like to have a little aquarium of their own, I will tell them how to make one, and then if they cannot make it themselves they can get some one to help them.

Buy a clear glass jar, six or eight inches in diameter, and about ten inches high, and fill it nearly full of pure sea-water. At the bottom of the jar place fragments of rock on which delicate and beautiful sea-weeds are growing,—such as a man can obtain with a hammer and chisel from the rocks

when the tide is very low. Let the sea-weeds grow in the jar of water for a few days, and then the aquarium will be ready for the animals which you may wish to put into it.

Now go to the pools of clear sea-water left by the tide, and look in the fissures of the rocks and in all the little corners, and even on the underside of overhanging rocks, and there you will find plenty of Sea-Anemones, perhaps of different sizes and colors; and you can remove them by carefully slipping your fingers under them, or by gently lifting them from the rocks by means of an old spoon-handle. You can carry them home in a pail of pure sea-water, or in a basketful of wet sea-weeds. Put about half a dozen of your Sea-Anemones into your little aquarium, with their broad base or foot downward, and then leave them undisturbed. After a short time they will fix themselves to the fragments of the rocks, or to the sides of the jar, and expand into forms as beautiful as flowers.

To make your aquarium complete, you will need to add several little star-fishes, and little sea-snails, such as you may find clinging to the

sides of the rocks, and a few little crabs and shrimps, and a few little fishes.

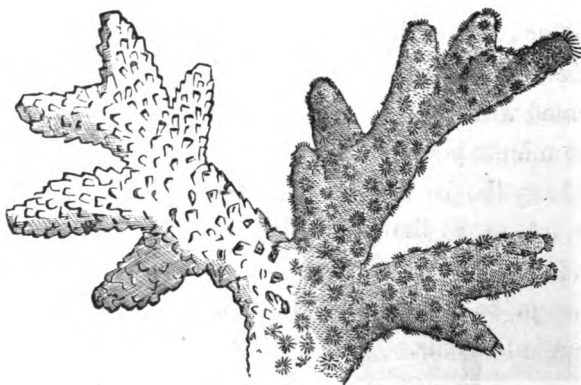
The little sea-snails called *Litorinas*, or *Periwinkles*, which I told you about in your little book of *Sea, Land, and River Shells*, are very important animals to have in your aquarium, for they eat up the minute plants which grow on the glass, and which make it dingy, and the water impure, if they are not removed. The *Periwinkles* crawl up the side of the glass, and with their tongue, which is armed with many rows of sharp teeth, they cut down the minute plants and eat them.

Keep the jar where the sun does not shine upon or into it, as the sun makes the water too warm, and then the animals die. Cover the jar enough to keep out the dust, but not so as to shut out the air.

THE MADREPORES, STAR-CORALS, &c., OR MADREPORARIANS.

THE Madrepores are among the most beautiful clusters of coral which you will see in a Natural

History Museum. Their forms are various. Some kinds of them are somewhat leaf-shaped ; others are much like cups and vases ; and other kinds of madrepores are branched in a very beautiful manner. Some kinds have the branches rather thick and stout, and others have them very slender and delicate.



The Madrepora.

One of the common forms of madrepora is shown in the picture on this page, the right-hand branches showing it as it appears when alive and covered with expanded polyps, and the left-hand branches

showing it as it appears when dead, and all the polyps are withered and gone.

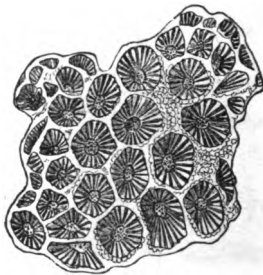
The Madrepolyp polyps are only about one eighth of an inch across, even when they are fully expanded, and they have only twelve arms or tentacles; and the polyp which is situated on the tip of the branch is always the largest, and stands out in the direction in which the branch is lengthening.



The Astroides, — a group of coral polyps.

On this page there is a picture of coral polyps which are somewhat related to the Madrepores, but which are different from them in appearance and in

their number of tentacles. This beautiful cluster of coral polyps shows you how they look in their different stages of expansion. Of the nine polyps in the cluster, four are almost wholly closed or shut up; three are partly extended and partly open, and only one is fully extended and open so as to perfectly show the position and form of the mouth and tentacles. The kind of coral which these polyps form is shown by this picture. The cavities or cells on this and on every other kind of coral mark the place where the polyps which formed the coral were situated.



The Astroides.

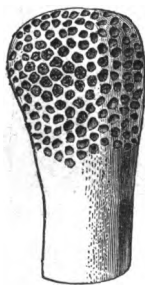
Here is the picture of a growing coral, each of whose branches ends in a polyp which is expand-

ed as beautifully as a flower, and the whole looks very much like a little flower-bearing shrub. You



The Tree Coral.

may call it the Tree Coral, although it has a much longer and harder name.



The Porites.

On this page there is a picture of coral called

Porites. You see that it is massive and blunt, and somewhat like a large thick club; but it is not always of this form. Some kinds of porites are massive, and some kinds are branched. The polyps which form this kind of coral are very small, hardly larger than a pin's head, and they have only twelve tentacles, and the little cells on the surface of the coral, where the polyps are situated, are very shallow. Some kinds of porites coral grow very large, a single mass being fifteen feet across!

There is one kind of coral that occurs in large masses, which are rounded on the upper side, and which has the surface covered with rather narrow winding furrows or trenches, as you see them in



The Brain Coral, — a portion of a large mass.

this picture, which shows you the appearance of a very small part of a large mass. The name of this

kind is *Mæandrina*, or Brain Coral. It is called by the last name, because its surface looks very much like the surface of the human brain.

The masses of the *Mæandrina*, or Brain Coral, vary in size from those that are only a few inches across to those that are ten or twelve feet in diameter! When alive it is covered with beautiful polyps, which join together and fill the furrows or trenches which you may see upon the dry coral, and which are shown in the picture on the opposite page.

Here is the picture of a coral which shows you very plainly that all the branches of a coral cluster



The Cladocera.

come from one stalk. When alive, the cavity or cup on the end of each branch is occupied by a polyp as beautiful as a flower. The name of this coral is *Cladocera*.

Here is the picture of another coral ; it grows in



The Merulina.

broad and leaf-like or vase-like forms, and is a very interesting and beautiful kind.

The Star-Corals grow in the form of rounded or hemispherical masses, and when alive they are covered with flower-like polyps, which vary from a quarter to half an inch across, and in some kinds the polyps are even an inch in diameter.

Some of the rounded or dome-shaped masses of the Star-Coral are no larger than you could hold in your hands, but masses of some kinds are fifteen or twenty feet across ! Some kinds are covered with pale-colored polyps, and other kinds are covered with polyps whose colors are as bright and beautiful as those of the flowers in the field and garden.

Here is the picture of a small part of a hemispherical mass of star-coral as it looks when alive and covered with beautiful star-like or daisy-like polyps.



The Star-Coral, — a portion of a large dome, alive.

There is one beautiful little star-coral which lives on the coast of New England. It is found in Long Island Sound, and it has been named Dana's *As-trangia*. It grows on rocks, and can easily be gathered and kept alive in an aquarium. It eagerly eats little mollusks and other little animals of the sea.

One of the beautiful corals which you will see when you visit a Natural History Museum is named

the Oculina. It occurs in the form of broad masses, from which arise beautiful tufts and tree-like branches. The form of a portion of a branch of the Oculina is shown in this picture.



The Oculina.

You have seen mushrooms and toadstools, which grow in the woods and fields, and you remember, I think, how they look. There are some kinds of coral that look very much like a toadstool without a stem, and on the next page there is a picture of one; and it is called the Fungus Coral.

The Fungus Corals are broad and low, and they vary in size from those that are not larger than the top of a tea-cup to those that are as large as the largest dinner-plate. Corals of this sort are

not attached firmly to the rocks, but they rest loosely on the rocks, reefs, and sand. When alive they are covered by one polyp, which has short and lobed tentacles. The coral whose picture you see on this page is formed by one polyp



The Fungus Coral.

only; that is, the hard parts, or skeleton, whose form you see here, is simply the skeleton of one large coral polyp; and the large masses of this sort that are even a foot in diameter are each formed by one polyp only.

I have only one more picture of coral to show you, but there are two more kinds of which I wish to tell you, and each of them has a long and rather hard name.

The Pocillopores are corals that are much branched, and the branches are blunt, and close together. The clusters of this kind of coral are

very beautiful, almost or quite as beautiful as branching madrepores, of which I have before told you. The animals which form the Pocillo-



The Pocillopore, — a small portion of a large cluster.

pores are very small, and they have twelve tentacles, and it is said that they are jelly-fishes and not true polyps.

The Millepores are corals which occur in branching clusters, and in plates and in masses. In the dead coral the surface is very smooth. The animals which form this kind of coral are also believed to be jelly-fishes, instead of true polyps.

There are, then, some kinds of jelly-fishes that are so different from the common kinds, that they look like polyps, and like polyps form coral.

The Astræas, or Star-Corals, the Mæandrinæ,

or Brain Corals, the Porites, the Madrepores, the Pocillopores, the Millipores, and many other forms of coral, live and flourish together in the ocean, much in the same way as the different kinds of trees, shrubs, and tender plants live and flourish together upon the land. They are indeed a sort of coral-grove on the bottom of the ocean; and a grove or forest upon the land is perhaps not richer in varied forms of animals and plants than is the coral-grove of the sea.

In the coral-groves live fishes whose colors are as beautiful as polished gold and silver and precious stones; crabs and shrimps of curious and strange forms; sea-worms, whose outspread tufts of scarlet and crimson are as beautiful as flowers in the tropics; nautili, with their wonderful chambered shells; sea-snails, whose shells are more beautiful than anything that human hands can make; pearl-shells, whose colors are like those of the rainbow, and whose treasures are prized as choice jewels; sea-urchins, sea-stars, and anemones, which make their home in every little glen and shady nook, and whose forms are so curious, and whose colors are so beautiful, that men make a

long journey over the seas, and brave the fierce storms of the ocean, that they may see them and study them; and in the coral-groves there grow sea-weeds of various forms and colors, adding their interest and beauty to the wonderful grove of the sea.

James Gates Percival, who was born in 1795, in Berlin, in Connecticut, once wrote a poem about the Coral-Grove; and as it is a beautiful poem, which every one likes to read, and as I know dear little children who are always delighted to hear it repeated, and as I think all other children will also like it, I will here give most of the poem, that they may read it when they are reading about the beautiful corals.

THE CORAL-GROVE.

Deep in the wave is a coral-grove,
Where the purple mullet and gold-fish rove,
Where the sea-flower spreads its leaves of blue,
That never are wet with the falling dew,
But in bright and changeful beauty shine,
Far down in the green and glassy brine.

The floor is of sand like the mountain drift,
And the pearl-shells spangle the flinty snow;
From coral rocks the sea-plants lift
Their boughs, where the tides and billows flow;
The water is calm and still below,
For the winds and waves are absent there,
And the sands are bright as the stars that glow
In the motionless fields of upper air:
There with its waving blade of green,
The sea-flag streams through the silent water,
And the crimson leaf of the dulse is seen
To blush like a banner bathed in slaughter:
There with a light and easy motion,
The fan-coral sweeps through the clear, deep sea;
And the yellow and scarlet tufts of ocean
Are bending like corn on the upland lea;
And life in rare and beautiful forms
Is sporting amid those bowers of stone,
And is safe when the wrathful spirit of storms
Has made the top of the wave his own:

.
Then far below, in the peaceful sea,
The purple mullet and gold-fish rove,
Where the waters murmur tranquilly,
Through the bending twigs of the coral-grove.

I will now tell you about coral reefs and coral islands. In the warm parts of the Atlantic, Pacific, and Indian Oceans there are many great banks or walls of coral, and islands of coral. In many cases the bank of coral is close to an island, skirting or fringing the shore, and the coral reef or coral wall is then called a Fringing Reef.

In many cases the coral bank extends around the island, but is not near it; and as the bank then seems to stand around the island like a barrier, it is called a Barrier Reef.

In other cases the coral bank surrounds a portion of water; it is then called a Coral Island, or an Atoll, and the water which it surrounds is called a Lagoon. There are openings through the barrier reef, so that vessels can sail in between the reef and the island, and thus find a safe harbor there; and there are openings through the reef that surrounds the lagoon, and vessels can also sail into the lagoon, in some cases, and there also find a safe harbor from the storms; and some of the lagoons are large enough to hold all the ships in the world!

This may not be very easy for you to remember now, but when you are older you will be glad to know what I have now told you.

Some of the banks of coral are many miles long, and there is one bank near Australia, the largest island in the world, which is a thousand miles long. They vary in width from a few hundred feet to a mile or more.

All of the banks of coral are formed by coral-polyps,—by coral-groves of which I have told you, and of which you have read in the beautiful poem of Percival.

But I hope that you will not forget what has been said about the way in which polyps form coral, and think that these great banks or reefs are made by the great labor of the polyps. The polyps only live, and eat, and grow, and increase in number, thus forming the beautiful clusters of coral, and the wonderful coral-groves; they never toil nor labor. And as they die they leave their hard parts on the spot where they have lived, and these at last are the coral reefs and coral islands.

It is only the surface of coral, even when it is growing, that is alive; all beneath the surface is dead. The large rounded masses of the Star-Corals, fifteen or twenty feet in diameter, are alive only on their surface, to a depth of less than one inch; and

a mass of the coral called *Porites*, fifteen feet in diameter, is alive only to the depth of a quarter of an inch. The corals die below as fast as they grôw above.

The bank or reef goes on increasing all of the time, that is, it comes nearer and nearer the top of the water as more and more polyps live and die.

At last the reef reaches the top of the water, — a vast pile of polyp skeletons, all firmly joined and cemented together, so that it is as firm as a wall or a bank of rocks. During all the time it has been growing upward it has been covered with living polyps, but as soon as it reaches the surface of the water the polyps die, for they cannot live when not covered by sea-water.

When the reef reaches the surface of the water, and the polyps die, the outside of the reef begins to be broken by the dashing of the waves; and the fragments thus broken from its sides are thrown upon the top of the reefs by the high waves, and thus the top of the reef soon appears above the water. When it appears above the surface of the water, its top is covered with large and small fragments of coral, and with coral sand that has come

from the crumbling of the coral. But the seeds of plants are carried there by the winds and in other ways, and soon minute plants begin to grow on the coral rocks and coral sand ; and then larger and larger plants spring up, and at last the coral reef or coral island is covered with trees and smaller plants ; birds and other kinds of animals find there a shelter from the hot sun, and from the storm ; and man also goes there and builds his house and makes his home. Thus, as you see, the piles of polyp skeletons — that is, piles of coral — at last make islands in the ocean, where animals and even man may live. There are hundreds of islands in the warm parts of the ocean which are made of coral, and were formed and covered with vegetation in the way which I have now described to you.

But the most wonderful part of the story about corals and coral reefs remains to be told. There are corals and coral reefs in the rocks, far from the ocean ; and they occur in the rocks of the hills and mountains, as well as in those of the valleys and plains ; and they are found in the rocks in the cold regions of the north, even in those which are now

almost constantly covered with snow. And such corals and coral reefs show that all of the places where they occur were once covered by the ocean, and that in that ocean the corals and coral reefs were formed just as corals and coral reefs are now formed. Corals are very abundant in the rocks of our country, and many of them are nearly as perfect in structure as those which sailors bring from the warm parts of the ocean.

At the falls of the Ohio, on the Ohio River, there are large masses of coral in the limestone rocks, and many of them are almost as perfect in their form and in their structure as when alive and covered with the beautiful flower-like animals which formed the masses; and at the same place there are branching corals, and corals in the form of cups and vases, some of them standing on the very spot where they once lived and grew, others scattered just as they were left by the waves and the tides many thousands of years ago, and all of them, together with the sea-shells that are there in the rocks, showing us that long ago the ocean covered the place, and that here was once a coral-grove as full of life and of beauty as the coral-

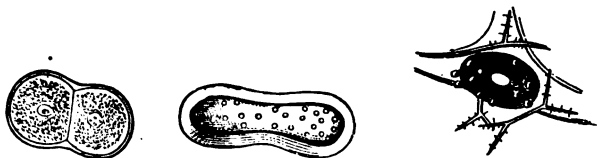
groves that are now growing in the warm parts of the ocean.

And here I want to tell you that it is believed that the limestone rocks themselves are made out of the hard parts of animals, and that most of them are made of coral and coral reefs that lived and grew in the old ocean that many millions of years ago covered all the places where limestone is now found.

The lime, then, that men use to plaster the walls and ceilings of houses, the marble that is used in making monuments, and large buildings in cities, and the marble slabs that are used for table-tops and mantel-pieces, and for a great many other purposes, and the blocks of marble from which beautiful statues are carved, were once the hard parts of coral polyps and of other little animals that lived in the old oceans!

I have told you that there are animals so small that many of them — sometimes hundreds — can live and move about in a single drop of water. These little beings cannot be seen with the naked eye, but by the aid of a microscope they have

often been observed, and drawings of them, very greatly enlarged, have been made, so that we can see just how they look when they are alive. Here are pictures of some of these strange little an-



imals. They are very simple in their form and in their structure, and so they are called the Protozoans, a name which means first, or simplest animals.

There are very many kinds and forms of protozoans, and of each kind there are countless numbers; they live in every ditch and pool, in every stream, pond, and lake, and in almost every part of the sea. They are of almost every form. Some kinds look like little plants; others look like cups, vases, bottles, and a great number of other articles. On the next page you may see two of their curious forms.

If you had not been told that these were pictures of little animals, you would think, perhaps, that

one of them is the picture of a little vase, and that the other is a picture of some curious toy.



The Podocyrus.



The Lagenula.

Some kinds of these animals are wholly soft and jelly-like, with no hard covering to protect their soft bodies; other kinds have a horny covering; and others have a shell which encloses and protects them.

On the next page there is a picture of one kind which is found in standing water in which plants have been decaying. It has been named the Vorticella, a word which means a little whirlpool.

You see that these animals look very much like little plants, with cup-shaped or bell-shaped flowers at the top, and for many years these curious little objects were believed to be true plants.

The Vorticellas are usually fixed to some object in the water, and the stem is often coiled as you

see one of them in the picture. Around the edge of each little cup you see delicate fringes, or cilia.



The Vorticella.

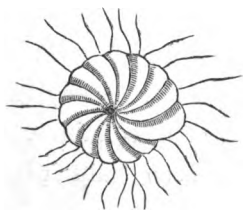
The constant movement of these little cilia causes currents in the water around the animals, and these currents bring floating particles of food to them.

The Vorticellas seem to be very timid little creatures, and if the water in which they are living is shaken, they are seen to shrink, and to quickly and tightly coil their slender stems. After a little while they slowly uncoil them, and soon are again waving their little fringed cups about.

In the picture you may see, at the top of two of the stems, two little cups instead of one. The Vorticellas increase in this way, one of the cups splitting or dividing into two.

One kind of vorticella is shaped much like a trumpet, and it is called the Stentor. It is larger than the one of which you have just been reading, and it can be seen by the naked eye.

The Vorticella and a vast number of other protozoans are often called Infusoria, because they are found in vegetable infusions, that is, in liquids in which plants have been left. Although some kinds of infusoria are fixed, most kinds are free, and by means of their delicate cilia or other little organs with which they are furnished they move rapidly about in the water.



The Rhizopod.

Other very minute and very curious little protozoans are called the Rhizopods, which means root-footed. They have this name because the little slender organs, which they thrust out from

the body, look very much like the fine, delicate roots of plants. In the picture of a rhizopod you can see the form of these root-like little feet. Many of the Rhizopods, like the one shown in the picture, have a shell, which is much like the shell of some kinds of mollusks, and in these shells there are many holes through which the feet are put forth. These kinds are called the Foraminifera, which means that these animals have pores, or holes in their shell.

These little animals are not only very numerous now, but they were also very abundant many thousands of years ago; and the tiny shells of the little creatures which lived so long ago are now hardened into great beds of rock. The chalk which you use every day in school is composed of the shells of these minute animals. Large cities even have been built of rocks that are mainly composed of the remains of rhizopods which lived on our earth long before man was created.

Rhizopods may be found on sea-weeds; and if you take a piece of sea-weed and place it in a glass vessel of sea-water, the little animals will sometimes leave the plant and collect upon the sides of the vessel.

The shells of rhizopods can sometimes be found among the dust and sand which is shaken from a sponge. When seen under the microscope the shells of these animals appear very beautiful.

Here is a picture of a rhizopod which can be seen only by means of a microscope, and which has no shell, and whose whole body is softer than



The Amœba.

the softest jelly-fish, or even the softest jelly itself; it is not much harder than the water in which it lives and moves, and it has no definite form. At one moment it looks like a mere patch of the thinnest mucilage; then it pushes out, or stretches out, parts of its body, forming long slender organs; then perhaps it withdraws them, or puts out more of them from other parts of the body; and so it is changing its form and appearance every moment. The name of this minute animal is Amœba, which means change.

The Amœba, then, has neither tentacles nor

eyes, nor mouth, nor stomach; but, strange as it may seem to you, it is a hungry animal, and when it comes to a particle of food, any part of its body acts as a mouth and stomach; it quickly closes around the particle and digests it. It even closes around minute shell-animals, and absorbs their soft parts and casts away the empty shells.

Far away in Egypt, a large country in the northern part of Africa, there are many great structures called the Pyramids. These are made of stone, and some of them are much larger and higher than any building or monument which you ever saw.

The Great Pyramid, so called because it is the largest one, is seven hundred and forty-six feet square; that is, each side of it is seven hundred and forty-six feet long; and it is over four hundred and fifty feet high, or more than twice as high as Bunker-Hill Monument. On the top there is a large place where people may stand or walk about. This one, and all of the other pyramids of Egypt, have one side toward the north, one toward the south, one toward the east, and one toward the west.

The Great Pyramid was once much larger than it is now ; it has been greatly worn away by the winds and storms.

The sides of this pyramid, and of many of the others, are now broken and rough, but there is reason to believe that when the pyramids were first built the sides were even and smooth.

Not far from the Great Pyramid there is another almost as large, and called the Second Pyramid ; and not far away still another, called the Third Pyramid, which is very much smaller, but which is over two hundred feet high, and each of its sides is over three hundred feet long.

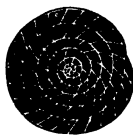
Near these three large pyramids are six smaller ones, three near the east side of the Great Pyramid, and three on the south side of the Third Pyramid.

The Pyramids were built several thousand years ago ; and it is believed that they were built by the rulers of the country for burial-places, that is, for tombs. It is believed that the rulers themselves were buried in the large pyramids, and that their near relatives were buried in the smaller ones.

East of the Second Pyramid there is something

almost more wonderful than the pyramids themselves. It is called the Great Sphinx. In form it is like a lion with the head of a man, and it is almost two hundred feet long, and is of one piece, and is cut from the solid rock!

Now the Pyramids and the Sphinx, of which I have told you, are made of limestone which is filled with shells that were formed by little rhizopods, — by animals very much like *Amœbas*.



The Nummulites.

These shells are called Nummulites, and here is a picture of one as it looks when cut across so as to show its partitions and chambers. Each little chamber was occupied by an amoeba-like animal, and each animal was connected by holes through the partitions with those next to it.

The name Nummulite means a coin, and it is given to these shells because they are shaped much like a coin or piece of money.

Most of the Nummulites are very small, even so small that they cannot be seen with the naked eye, but some kinds are half an inch across or more, and others are even an inch and a half in diameter.

A very celebrated man by the name of Strabo, who lived many hundred years ago, was the first, or one of the first men who carefully observed these shells in the stones of the pyramids; and he has told us that the people of Egypt believed that these shells were lentils of the same kind as those which the workmen who built the pyramids used for food, and that in some way the lentils had become buried in the rocks, and had been turned into stone and preserved !

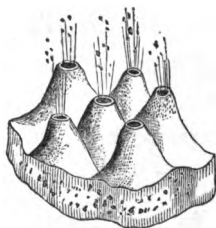
Rocks hundreds of feet in thickness are made up of the shells of Nummulites. Many large mountains are composed of the limestone which is mainly made up of these shells. Such mountains are among the Alps in Switzerland and in the northern part of Italy, and they are also found in Greece, Syria, and other countries.

There is room in this little book for only one more story about animals, and that shall be about the Sponges.

Do you know that the sponge which you use in washing your hands and face was once a part of a living animal, or rather a part of many animals united together?

The sponge does not look like an animal when we buy it at the shops; it looks more like a plant; and for a hundred years or more sponges were supposed to be strange kinds of plants; and even now many persons believe them to be plants; but those who have observed and studied them the most carefully now believe them to be animals.

The dry sponges which we see in the shops look very differently from the sponges which are alive and growing on the rocks at the bottom of the sea. Here is the picture of a small portion of a sponge as it appears when alive.



A small portion of a living Sponge.

The living sponge, so far as we know, is constantly in action, that is, the living being or group of beings cause currents of water to flow constantly from the openings which cover the surface of the sponge; you can see the form of these openings in the picture on the opposite page.

There are very many kinds of sponges, even three hundred kinds or more. Some kinds live in lakes, ponds, and streams, but most kinds live in the sea.

Many of the fresh-water sponges are of a beautiful green color, and we can easily find them.



▲ Branching Sponge.

Sponges are attached to some object in the water, and are often found hanging from the under sides of shelving rocks. They grow in curious and often in very beautiful forms. Some kinds

cover the rocks like a carpet; some kinds grow in clusters; some kinds branch like trees and shrubs; and others take the form of cups, goblets, and vases.

Sponges have sometimes been named from their forms, and so we hear of the Bell-Sponge, the Feather-Sponge, the Fan-Sponge, the Mermaid's Glove, and many others.

The largest and most beautiful kinds of sponges live and grow in the warm parts of the ocean. In shallow waters they are obtained by means of a three-pronged spear or harpoon, which tears them from the rocks. In deep waters, where the finest sponges grow, they are obtained by divers, who go down and break the sponges from the rocks with the hand or with a knife.

Although the most beautiful kinds of sponges grow in the warm parts of the ocean, some very beautiful kinds are found even on the coast of New England; and when you visit the Natural History Museum of the Peabody Academy of Science, at Salem, Massachusetts, you may perhaps see a large and beautiful sponge which grew in the sea-water under Beverly Bridge.

From time to time minute jelly-like particles are formed in the inside of the large tubes which run in all directions through the sponge. These minute forms are the young sponges, and they are at last driven out into the water by the currents of which I have told you. Instead of being unable to move from place to place like the parent sponge, they move freely about in the water by means of hair-like organs or cilia with which they are furnished. After a time they attach themselves to the rocks or other objects in the sea, and grow into sponges of the same form as their parent.

Every part of the living sponge is covered with a slime-like substance, which is much like that of the amoeba, and it is by this substance that the sponges which we use are formed.

The frame-work or skeleton or the hard parts of sponges vary in form and in substance. The common sponges which we use are made up of horn-like tubes; but some kinds have their hard parts made up of minute crystals of flint, and others have them made of minute crystals of limestone.

Sponges are found embedded in the rocks in many parts of our country and in other countries. Those found in the rocks are called fossil sponges, and are different from those which are now living in the ocean.

Those which are found in the rocks lived many thousand years ago, when the ocean covered the places where they are now found, and when the rocks in which they are embedded were soft like the sand and mud which now form the bottom of the ocean.

Beautiful fossil sponges are found in the limestone rocks at the Falls of the Ohio, at the same place where there was once a coral-grove, of which I have before told you.

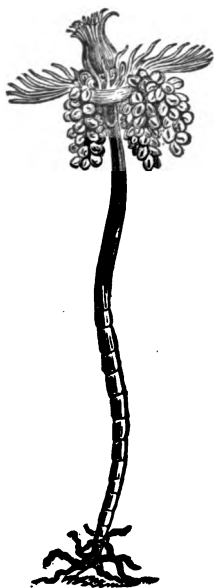
You have, I think, seen the stone or mineral which is called flint. Masses of it, called nodules, are found in chalk. It is also found in the limestone rocks in various parts of our country and in other countries. Many years ago, before there were matches to make fire with, people were obliged to use a piece of flint in making a fire ; they struck the flint against a piece of steel, and thus made a spark of fire, which they let fall upon something

that would easily burn. Flints were also once used in gun-locks, and the soldier and the hunter were always careful to have good pieces of flint for their guns; because if the flint was bad, it would not strike fire.

Strange as it may appear to you, the flint nodules which are found in chalk and in limestone, and the pieces which were long ago used for striking fire, and those which soldiers and hunters used in their gun-locks, were once living sponges growing on the rocks at the bottom of the sea! Men know that this is true, because they have examined very thin slices of flint by means of the microscope, and have seen that it has the structure of a sponge; and portions of sponge itself, not yet hardened into stone, have even been found inside of the flint.

Dear children, we have now come nearly to the end of our last little book of Pictures and Stories of Animals. I hope that you have enjoyed reading these little stories, and that you now wish to know more about the many and wonderful animals which our Heavenly Father has made

to live on this beautiful earth, and which He constantly watches over and cares for, forgetting neither the beasts of the field, nor the birds of the air, nor the fishes of the sea.



THE END.

